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SUDAN PROFILE

A COMPARATIVE CULTURAL STUDY

BY

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INTRODUCTION

The historical development of geography has witnessed cycles of growth and decline. At various times in the past, geographers, or groups of geographers, have conceived of the field in quite different terms. This has led to attempts to restrict geography to the narrow scope of either the physical phenomena or the human phenomena. Nevertheless, the trend towards identifying the particular character of a region is the primary aim of the geographer since the earliest beginnings of geography. The concept itself stems, in modern geography, from Richthofen's synthesis of the views of Humboldt and Ritter, and has been most fully expounded in Hettner's writings. In 1898 he found that «the distinctive subject of geography, from the most ancient times to the present, was the knowledge of earth areas as they differ from each other. In 1905 he wrote of the chorological science of the earth or the science of earth areas and places in terms of their differences and their spatial relations» [1]. The same view is taken by Hartshorne

[1] HARTSHORNE, R., *Perspective on the nature of Geography*, Chicago, 1959, p. 13.

in his definitions of geography as the study of «the areal differentiation of the earth surface».

With this definition of the goal of geography through its long history, I feel, being an Arab geographer in an Arab country, that it would be appropriate to mention as briefly as the nature of the subject would allow, the weight given to the study of the areal differentiation of the earth surface by Arab geographers. The study of regions and regional interrelationships occupies a prominent part in the writings of many Arab geographers. The regional geography of Al-Iṣtakhri, to take one example, is based on physical, and not political, divisions. His maps of physical regions are the basis of his geographical studies. On this he said «For each region in the lands of Islam I made a separate map showing the shape, towns and all the necessary information about the region» [1]. Al-Iṣtakhri's interest in regional interrelationships is stated thus, «My intention in writing this book is to give a detailed description of the lands of Islam, region by region, to clarify the location of each region and its relations to other regions» [2].

Arab geography was not a mere compilation of data. Our geographers, on the contrary, highly appreciated the value of travel and personal observation in the study of geography. In his book, «'Aḥsan Al-Taqāseem Fi Ma'arifat Al 'Aqāleem», Al Maqdisi gave a very vivid picture of his scientific method : «There is no region that I have not penetrated, no factor or cause, however small, that I have not investigated, nor have I neglected asking questions and looking into metaphysical matters. My book, therefore, has included three parts : the first part based on personal observations, the second based on information given by eminent scholars and the third based on books written on the subject» [3].

The study of the character of a region is deeply rooted in geography, in our Arab legacy and is essential to modern geography. The

[1] Al Iṣtakhri, *Roads and Kingdoms* (Almasâlik wa-l-mamâlik), Ed. Mohammad Jabir Alḥayni, Cairo, 1961, p. 15.

[2] *Ibid.*, p. 19.

[3] Al Maqdisi, G., *The Best Classification of Regions* ('Aḥsan Al-Taqāseem), Leiden, 1906 — reprinted by Al Muthanna, Baghdad, pp. 43-46.

study of the integration of natural and human laws in a homogeneous geographic unit is a dominant trend in the works of modern geographers regardless of their ideologies, as is evident from current dialogues between Western and Soviet geographers [1].

This type of study is, by its nature, an ultimate aim in geography, with dimensions that include :

1. the historical dimension that strikes deeply in the past to reveal patterns that explain some aspects of the personality of the region.

2. the spatial dimension that extends beyond the borders of the region and shows the interaction that leaves its imprints on the landscape and thus helps in defining the features of the region.

3. the study of the totality formed by the integration of its individual elements — elements that form a network or pattern resulting from the interactions between natural and human factors. This regional pattern is the outcrop of historical evolution, a series of past patterns each of which is a complete geography in itself, each pattern being influenced by its preceding patterns and influencing its successors.

The nature of the subject and its inherent difficulties thus become apparent. Such difficulties have to be faced by the geographer since his first and foremost task is to expound clearly the integrated character of a region. It is perhaps what our predecessors among Arab geographers felt as their task when some of them gave their books the titles like «The Picture of the Earth».

Synthesis in geography is both a science and an art. Not much difference can be traced in the drawing of a portrait or the configuration of landscape features on a map. The difficulty in geography is that the diversity of material in any region is so wide that the geographer, like the painter, is forced to select those aspects that are significant

[1] For example, see : *Soviet Geography*, New York, Sept. 1962, where there are several articles on unity and duality in geography. The whole number is taken up by the methodological problem of the meaning of unity in geography.

Also : Hooson, D.J.M., *Some recent Developments in the Content and Theory of Soviet Geography*, March 1959, pp. 73-82.

to the purpose of his study. In other words, complete objectivity, then I dare say, is impossible in geography. It is a must for the geographer therefore, to select a few limited facts from the unlimited mass of material that he finds in his region of study. It is my intention in this study to select a few facts that may help in understanding the character or the « face» of the Sudan.

The definition of the character of a country — as mentioned above — is generally accepted as the highest stage of synthesis in geography. My attempt in analysing the personality of the Sudan, though incomplete, is yet necessary, because such a study is a guide to future studies aiming at elucidating the different aspects of this personality. Systematic studies of the different branches of Sudanese life, and studies aiming at the integration of Sudanese reality, enrich each other and lay down the foundations for applied geography and the geography of planning. This paper is an attempt, a step on the long road; and, like all beginnings, it is not without expectation and hope.

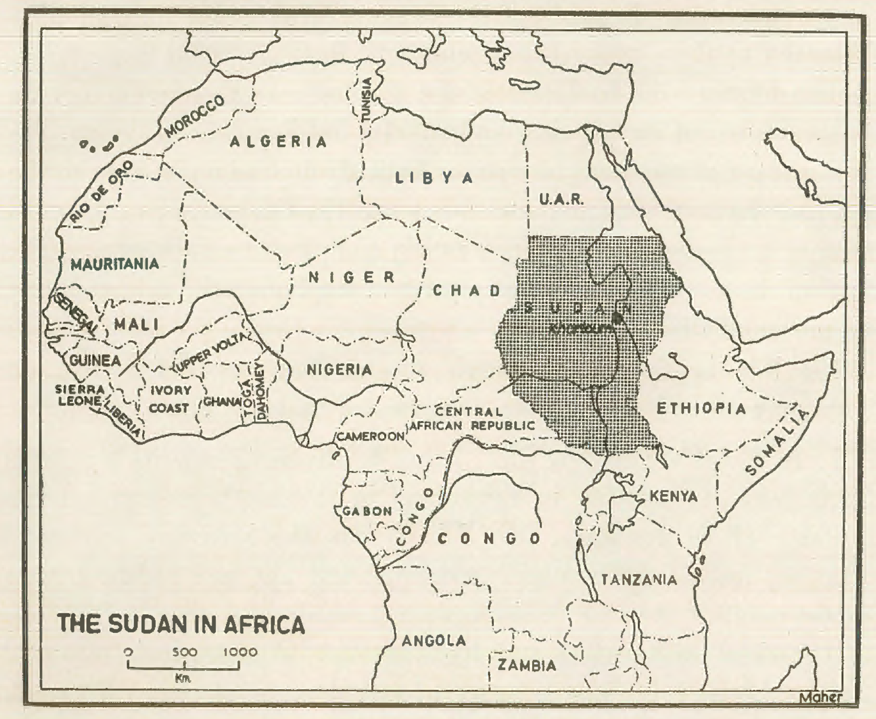
I. — THE MEDIAN SUDAN.

Gradation :

The Sudan is the largest country in Africa, with an area of 2 ½ million sq. km., followed by Algeria and the Republic of the Congo Kinshasa, the three being the only countries in Africa with an area exceeding two million sq. kms. each.

Algeria contains a Mediterranean belt and a desert belt, while the Congo is dominantly tropical. The Sudan is unique among the big African states in its wide range of geographical belts. Starting from the Northern boundary of the Sudan — at latitude 22° N. — we encounter pure desert where life is securely restricted to the banks of the Nile. South of this desert there is a belt of marginal summer rains which can hardly bear any life afar from the river. In the central Sudan dual dependence on Nile and rain waters becomes well marked. This region is part of a huge belt teeming with life and extending from the Atlantic coast in the west to Ethiopia in the east. The Nile and its tributaries penetrate deeply southwards into the Sudd area and

up the plateaus of the Equator and the Nile-Congo divide. In the south, in Uganda, there is rain all the year round, while in the north there is pure desert, and in between perpetual rain and perpetual life evolve and intertwine.



MAP. 1.

The vast area of the Sudan is distinguished by such compactness that is more like a rectangle with few wedges and appendices. The dominant pattern of the countries in East Africa is influenced by the distribution of physical features so that we find countries having the shape of narrow strips parallel to the coast as in the case of Somalia and Mozambique. In West Africa the pattern is that of narrow strips, of dwarf size, at right angles to the coast, while most of the land locked states of West Africa include vast sandy empty spaces; e.g. the Niger and Chad. The Sudan, however, is neither elongated nor small in size nor a box of sand like the land-locked states of West Africa. It has, moreover, a seafront connecting it to the outside world (map 1).

Median Position with Respect to the Nile :

The map shows that the Nile is the dominant physical feature in the Sudan. It is in the Sudan, like the Atlas mountains in Algeria, and the Congo river in the Republic of the Congo. All these are the dominant features in their respective countries. But the Atlas mountains, though forming the backbone of the structure of Algeria, do not lie at the centre of its physical layout. In the Republic of Congo, life does not concentrate on the river or basically depend on it, despite the fact that the state is named after the river. The Congo river contributes fishing, transportation and generating of hydro-electric power. The Nile on the contrary, is, in many parts of the Sudan the sole and only supporter of life.

The Nile in the Sudan provides a median stage of interaction between man and river in the countries of its basin :

1. In Egypt the Nile is life. There is obvious similarity from this angle between the Nile in Egypt and in the northern parts of the Sudan. «It is possible», says J.A. Wilson the historian, «to stand with one foot on the fruitful alluvial soil and one foot on the lifeless desert sands. As one looks inward towards the river valley, one is conscious of bustling and teeming life. As one looks outward the sandstone hills, one is aware of vast desolate stretches where no life is possible. Inevitably the polarity of attention is the great muddy river which brings the life-giving water and soil. If the Nile were by some chance cut off, that soil would dry to dust and blow away. The land of Egypt would become a vast dry wadi of the great North African Desert» [1].

2. The Nile, in the northern parts of the Sudan, is the axis round which life rotates. In the Sudan and the regions of the Nile sources, this axis takes a complex pattern, both in form and function. Approaching the north, tributaries begin to flow in the main river approximately at latitude 17° N. : the Atbara then the Blue Nile at 15° N. with its great tributaries tapping a vast catchment area in the Sudan and Ethiopia, and the White Nile at 10° N. with its southern extension where Ethiopian waters carried down by the Sobat intermix with Equatorial waters carried down by Bahr el Jebel and Bahr el Ghazal : the land of rivers.

[1] Wilson, A., John, *The Burden of Egypt,* pp. 8-9, The Univer. of Chicago Press, 1957.

In central Sudan, life is dependent on the river in the Gezira and the White Nile lands, while in western Sudan, life is independent of the river. In these central parts, therefore, there is orientation both towards and away from the river. In the Sudd region of the south, the name Sudd or barrier itself is indicative, the river becomes more of a hindrance to life instead of being life's artery. Here there is too much water, and people are driven away from the river during the floods. In the Sudd, the river repels while northwards the river attracts. South of the Sudd people are once more attracted towards the river which is united in the relatively steep channel of Bahr el Jebel, the transitional stretch between the Sudd and the lakes plateau. The site of Juba, the province headquarters of Equatoria, south of the Sudd resembles that of Malakal and Wau, the province headquarters of Bahr al-Gazal and Upper Nile, west and north of the Sudd respectively.

3. The tributaries of the Nile beyond the Sudan become very broad in Ethiopia, a breadth that reaches in places between five and ten kilometres. Life here, as in Uganda, with some environmental differentiations, is not dependent on the Nile because of ample rainfall, though modern technology has made possible the utilization of hydro-electric power whose grid system has reached Kenya. Ethiopia, like Uganda, is not basically dependent on the river because of heavy rainfall. Moreover, Ethiopian tributaries are deeply incised on the plateau, thus forming formidable and inaccessible chasms. Settlements, consequently, are situated away from the deep and wide rivers.

To sum up :

a) In Ethiopia people are driven away from the rivers, in Egypt people are attracted towards the river, while in the Sudan the

role of the river is medium between the extremes of repulsion and attraction.

b) Uganda and Ethiopia are the countries of the Nile tributaries. Egypt is the land of the single and unified valley. The Nile in the Sudan is a compiled pattern of single and multiple flow. This is another aspect of the median position of the Sudan in relation to the flow of the Nile added to the median position in relation to the utilization of, and dependability upon, the Nile. This explains the hydrological character of the Sudan and the relations of the Sudan with the Nile countries, relations that reflect the dual dependence of the Sudan on rain and river.

II. — THE NILE AND THE STATE.

This median character of the Sudan has left its marks on the political set-up of the Sudan with multiple environments varying in their dependence on the river, and in their interest in Nile problems :

1. The complete integrity between the Nile and life in Egypt has left its strong mark on Egyptian life from the earliest times up to the present, from the time of the diversion of the Nile course during the reign of Menes, and even before that, up to the building of the High Dam. The explanation of the influence of the Nile on Egypt opens the way for comparative study of the patterns of life in the lands of the Nile.

Throughout history, no political entity has ever been established away from the Nile in Egypt. This is perhaps too obvious to warrant mentioning; nevertheless, it is of far reaching importance for purposes of comparison. This is because life in Egypt is associated : first with the existence of the river and, second with its regime of flooding so that individual or unorganized efforts are useless in coping with the challenge posed by the river. For this reason Egypt has known from the earliest times the unity of its people and the establishment of a central state. It was imperative that the government should wield strong power to be able to establish administrative organs

spreading out along the canals in order to extend irrigation schemes, maintain law and order, supervise the crops and collect taxes. This was the reason for the ancient links between the administrator, the engineer and the tax collector, an ancient tripartite — system that influenced the long history of Egypt [1]. This system, when positively active, could lead to a high degree of efficiency and social progress. Evidence of such progress is found in the description of Egypt given by Ibn Jubair who visited Egypt during the reign of Salah el-Din Al-Ayyubi. Ibn Jubair travelled from Alexandria to Cairo, then to Upper Egypt and Aiḍab and crossed the Red Sea on his way to Mecca to perform pilgrimage. He says «The people of Egypt have reached the maximum of welfare and plentitude and they do not need any subsidies from the ruler» [2]. On the other hand, this system, at times, could degenerate to the depths of poverty and starvation. A glaring example is given by 'Al-Maqrīzi in his books «'Igāthat Al-'Ummah». This book studies the history of famines in Egypt and ascribes their causes to human factors. Al-Maqrīzi says the responsibility is that of the government, and can not mainly be ascribed to natural phenomena. Here he is a pioneer of possiblism that rejects crude determinism [3].

2. Turning to Ethiopia, we find a basic dependence on the rain, which, by its nature, does not need for its control either a central governmental organization or a central authority. This fact, together with the mountainous nature of Ethiopia, and the action of river erosion in dissecting its surface into blocks separated by river gorges,

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(1) HAMDAN, Jamal, *Egypt's Identity,* Cairo 1967, pp. 51-54. (Arabic).

(2) IBN JUBAIR, The Andalusian, *The Travels of Ibn Jubair,* Cairo, 1955, ed. by Hussain Nassar : The ration — referred to in the text—is the amount of food providence or the like allotted to a person for a day, or month or year. See the editor's footnote, p. 10.

(3) AL MAQRÎZÎ, Taqiyy-Uddin Ahmad Ibn 'Aly, *The Succour of the Nation through Deliverance from Affliction,* edited by Badruddin Al Sibâ'i, Homs, 1956 (Arabic), *Ighâthat al-'Ummah bi Kashf al-Ghummah.* See pp. 28-31 for the description of the famine of 596 A.H. (1200), for its causes, pp. 41-62.

that form secluding natural defence lines, are the reasons why the unification of the whole of Ethiopia under one central authority to which all the local lords, or heads, are subjected, has taken many centuries of strenuous efforts to be fulfilled. This unity is dependent on a new network of land and air communications.

3. The system in Equatorial Uganda, apart from minor differences of detail, is similar to that of Ethiopia in its causes and results. The area of the Equatorial sources of the Nile, has witnessed the rise of several kingdoms, some of which still continue to influence the political life of Uganda, eg. the Baganda, the Banyankole, the Banyoro, etc.

4. In the Sudan there were more than one nucleus of civilization. Before the demarcation of the present political boundaries in the nineteenth century, each region in the Sudan was, to a great extent, self-sufficient. Life in the main cultural regions of the Sudan was dependent mainly on its local resources, and the cultural links that each region formed with the outside world.

There were three main cultural areas :

a) The core area around which the Fung Kingdom was formed.

b) The core area of the Kingdom of Darfur.

c) The northern core area of the Nubian Nile.

The three core areas vary in location with geographical similarities and differentiations. A triangle drawn with its corners at Sennar, Darfur and Nubia will have the confluence of the White and Blue Niles approximately at its centre.

The cultural pattern of the northern sector, i.e. Nubia, is similar in its physical circumstances to that of the lower Nile valley in Egypt, except for the existence of cataracts that characterize the Nubian Nile with small cultural areas linked by the Nile like the beads of a necklace. These home areas facilitate the rise of more than one centre of civilization and more than one kingdom : Kush, Napata, Muqurra, Alwa and Merole are examples. There is also a continuous line of

archaeological sites, contemporaneous with, or successive to each other, extending from the First Cataract to the confluence of the White and Blue Niles [1].

The Fung Kingdom depended on both river and rain as water resources. The choice of Sennar as the capital of the Kingdom was due mainly to its strategic location in the heart of the eastern sector of the Sudan. Sennar controlled river and caravan routes; it was a meeting place for merchants trading with Egypt and the Far East via Suakin, Massawa and Ethiopia [2]. The orientation of the Fung Kingdom was mainly on a north-west axis following the Nile. There was an areal eastward and westward expansion, but it did not shift the kingdom away from the Nile axis.

The core area of Darfur was the Jebel Mara massif where rain is relatively plentiful and where defence against enemies is provided by the physical configuration of the Jebel. Mohammad Omar Al Tunisi in the account of his travels in the Fur Kingdom says [3], «It is a Jebel that crosses the Fur region from end to end in a straight line and there are several passes by which people ascend. Each section of the Jebel has its separate name apart from the general name. The Fur live at the top and avoid the plain because the top provides more safety to themselves and their properties. There are nations and innumerable peoples on the Jebel, of which the famous Konjara tribe is the tribe of the Sultan of Darfur. There are several caves in the Jebel in some of which the sons of the kings are imprisoned and in others his ministers» [4]. What concerns us here is the connection between the

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(1) ARKELL, J., *A History of the Sudan from the Earliest, Time to 1821,* London 1955. The maps (3-10) are of special significance coming in a chronological order from the 16th to the 18th centuries.

(2) ʿABD AL JALIL, Alshâtir Busaili, *An Outline of the History of the Sudan in the Nile Valley,* Cairo 1955, pp. 31-32. (Arabic).

(3) AL TÛNISI, Muhammad Ben ʿUmar, *Sharpening of the Wits on the History of the Arab Lands and the Sudan.* Edited by Khalîl ʿAsâkir and Mustafa Musʿad, Cairo 1965, p. 61. (Arabic). Tashḥīdh Al-Adhhan Bi-Sirat Bilad Al-ʿArab Wa-ʾl-Sudan.

(4) *Ibid.,* p. 153.

Jebel and the ruling family, though the origins of that family, like that of the Fung, still needs further investigation [1].

Both kingdoms of Fur and Fung had strong relations with Egypt. Caravans of Darfur and Sennar used to visit Egypt annually. Hence again Al Tûnisi gives us a very vivid picture of the strength of ties between the two kingdoms and Egypt when he speaks of his family. He is of Tunisian origin, with the father in Darfur, the relatives in Sennar, and the meeting of the family in Cairo after the return from pilgrimage to Mecca [2].

The northern orientation and the bonds with Egypt were complemented by links across the whole length and breadth of the pastoral belt south of the Sahara, links that extended from the Atlantic shore to the Highlands of Ethiopia and beyond to the world of the Indian ocean that leads to the Far East. Caravans following the east-west axis also crossed the Sahara along several routes, uniting the whole region in one vast network which, though containing diverse local environments, was unified by the Arab-Islamic civilization in one cultural realm [3].

The existence of three separate cultural nuclei has had its cultural significance when it became possible for the confluence of the White and Blue Niles to unite the three areas and the regions to the south in one political entity. This unification by the centre of the triangle of Sennar and Darfur kingdoms and the northern Sheikhdoms, took place at the expense of the far corners. After unification, the new centre has given old centres a new and vigorous cultural life. This new life depends mainly on the Nile agricultural schemes seen most clearly in the expansion in the Gezira and the spread of pump shcemes

(1) Crawford, G.G.S., *The Fung Kingdom of Sennar,* Gloucester 1951, pp. 134-142. See also Busaili's, pp. 20-35.

(2) Al Tûnisi, *ibid.,* p. 32.

(3) Fage, J.D., *An Atlas of African History,* London 1958, p. 17. «Transcontinental Interrelations in the Sudanese Belt from the Atlantic to the Indian Ocean». See also : Davidson, B., *Old Africa Rediscovered,* London 1961. Chapter 3 deals with «The Kingdom of the Old Sudan», pp. 61-116, and map 2, p. 63.

southwards along the Blue Nile. The influence of the Nile is seen at present in the relationship between the two agricultural expansions in both Egypt and the Sudan as a result of the construction of the High Dam in Egypt and the Khashm el Girba and Roseires Dams in the Sudan.

If we regard the Gezira as a «northern delta» with vast cultivable areas that attract a great concentration of agricultural schemes, then the Sudd area in southern Sudan may be regarded as a «southern delta», pastoral and agricultural, which may become, through scientific development, a fourth core area from which civilization spreads to all the neighbouring areas [1].

Thus, the future of the Sudan is becoming increasingly connected with the Nile schemes and the effects that these schemes will have on the economical and political weight of the Sudan. Nevertheless, a large part of the Sudan will always remain dependent on the rains and on means of rainwater storage such as fulas, hafirs and tanks. This dualism of dependence on rain and river will continue to be reflected in the Nile irrigation schemes and rain cultivation, in the degree of cohesion between the different parts of the Sudan and in the relationships between central and local systems of governments.

This diversification could be both a source of, and a saferguard to, enrichment. The formula, cotton and gum Arabic, continues to have its weight on Sudanese economy so that more attention is given to gum Arabic whenever there are signs of poor cotton yields. The dualism — Nile and rain — will continue, despite future developments, to influence the balance of life in the Sudan. This dualism is in its turn, geographically, median between the systems of Egypt and Uganda.

III. — ECUMENE AND THE STATE.

The two main axes of population distribution in the Sudan are the Nile axis and the pastoral axis on the Sudanic belt. Where the two

(1) «The Equatorial Nile Project and its effect on the Anglo-Egyptian Sudan», being the Report of the Jonglei Investigation Team. This is the most comprehensive treatment of the subject.

axes meet, i.e. in the Gezira, we find the economic and population centre of gravity in the Sudan. The under-populated areas of the Sudan are the dry deserts of the north and the forest and swamp deserts of the south. In the Sudan there are no population concentrations on the peripheries. The Sudan is distinguished by the existence of an ecumene mass in the Gezira central area. Away from this ecumene, population is sparse except for narrow strips of dense population along the Nile in the north and south, and scattered hills of sedentary population in eastern and western Sudan. This is the general pattern of the distribution of the Sudan's population which has now reached the 14 million mark (1968).

The Sudan ranks sixth among African countries in size of population and fourth among the tropical countries of Africa, the remaining three being Ethiopia to the east, the Republic of Congo Kinshasa and Nigeria to the west. The location of the Sudan is more or less central among the big African tropical units, leaving common boundaries with two of them. This location together with the geographical extent of the Sudan and its population size make it easy to understand the importance of the Sudan in Africa, an importance that is derived from advantages of location and spatial relationships as well as from the size of population and the level of civilization.

This ecumene in the heart of the Sudan has its advantages and also its problems :

1. Areas of population concentration, by their nature, help in the formation of stable political units; while in sparsely populated areas it is difficult to form large and stable political units. Here we are reminded of how the confluence of the Nile has united the old core areas of civilization into one state while secondary cores are still waiting to be developed and effectively incorporated in the Sudanese state.

2. There are three areas of population concentration in the vertical or Nile axis : the first is in the lower valley of the Nile in Egypt, the second in central Sudan and the third in the Equatorial sources of the Nile. These three ecumenes are separated by underpopulated belts. Where international boundaries cross underpopulated areas, problems might arise because the ecumenes surrounding the underpopulated areas regard them as spheres of expansion. Such underpopulated areas might assist in the weakening of cultural ties if long distances separate them from the ecumenes. The dispopulated areas might also form political and administrative boundary zones. The opposite is true where boundaries cross populated areas because tribes and clans will be divided in two or more states, in which case a variety of international conflicts might arise.

3. If we turn from the theoretical basis to the practical application of these theories, we find that the northern parts of the Nile axis in the Sudan and in southern Egypt are areas of outward moving population, because present day geographical controls permit the existence of a small number of people and any surplus has to migrate. The flow of population is towards the ecumenes of the Nile axis and central Sudan. The result is that this underpopulated area between Egypt and the Sudan, instead of being a barrier, has become a bridge across which cultural influences flow and a factor linking the north and the south culturally. Members of the same Nubian family are often found scattered in both Egypt and the Sudan. There are also migrations of whole tribes from northern to central Sudan. This link between Egypt and the Sudan through Nubia is strengthened by religious unity and by the Arabic tongue which is a common language transcending tribal dialects.

4. The situation is different in southern Sudan. The Zande tribes are an obvious example [1]. These tribes inhabit the elevated areas of the Nile-Congo, and are divided between the sparsely populated areas of the Congo basin and the Sudd Region. The international boundaries cut across Zandeland dividing the Zande between the Sudan, the Republic of Congo and the Central African Republic.

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[1] ʿAWAD, Mohammad, *The African Nations and Races,* Cairo 1965, fig. 14, opposite p. 192 for his descriptive study of the home of Zande, pp. 188-190. (Arabic) : Al-Shoʿub wa Al-Solalat Al-Ifriḳiya.

The interior location of the Zande area together with its cultural connections with West Africa, East Africa and the Nile [1] show one aspect of boundary problems in terms of the relations between the northern ecumene and the south-west.

5. This situation is repeated, though on a smaller scale, across the southern and south-eastern boundaries, e.g. the Anuak in the basin of the Akobo river between the Sudan and Ethiopia, and the Acholi between the Sudan and Uganda.

6. The same problem, but in a different context, is found along the boundaries between the Sudan and Ethiopia because of the different locations of the Sudanese and Ethiopian ecumenes. The Ethiopian ecumene is primarily influenced by the system of winds, rainfall and flora. The rain-bearing winds, to a height of 3000 m., blow from the south-west. Above that height the rain-bearing winds blow from east to west, especially during the height of the rainy season. What interests us here is that the ecumene of Ethiopia is facing that of the Sudan and is not far away from it, the zone separating them being rich in plant life. Movements of pastoral tribes across this zone are quite frequent. To this is added the difference in the mountainous nature of the Ethiopian ecumene and the plains of the Sudanese ecumene and the resultant differences in civilization and ways of life. The Sudan and Ethiopia are among the four big African states. This factor, together with the above mentioned facts, may help us to understand more fully the thorny problems arising from the free movement of tribes across a boundary zone rich in plant life and tying the plateaus above to the plains below. This type of interaction is to be found, to a less extent, along the western border.

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[1] Seligman, C. G., *Egypt and Negro Africa,* London 1934. The book includes a study of the harp used by the Zande (p. 12) and points of similarity between this instrument and those in the Congo Basin and Ancient Egypt. He comes back to the same subject on p. 65. He also makes a survey of the areas from where he got proofs for cultural relationships between the Nile Valley south of Khartoum and other areas in Nigeria and east, west and south Africa.

The problem of the Sudanese ecumene is not only a case for the study of the relation of its location to the political boundaries of the Sudan; it is also a case for the study of the relationships of the ecumene to the adjacent ecumenes and the nature of the Sudan frontiers. These problems cannot be tackled in developing. Africa except in the spirit of co-existence, co-operation and mutual respect of each other's boundaries, a respect that does not restrict the free movement of people across the borders.

Another aspect of the relations between the Sudan and its neighbours is seen in the population gradient. In theory, a normal state is one whose population gradient is in equilibrium with the neighbouring states. It is also considered normal for a state to be surrounded by four to five states, and that a state whose ratio of population to that of the populations of the bordering states is 1 : 4 or 1 : 5 is considered a balanced state from the point of view of relative size [1]. Few African states attain this ratio; the majority fall far below.

Thus we can divide states into three types according to population gradients : those with positive population gradient, those with negative population gradient and those whose gradient is in a state of equilibrium. The Sudan is not included in the group of positive population gradient in which Egypt, Nigeria and South Africa come at the top. It is also not included in the third group. In fact, the Sudan is among the first in the group of negative population gradient since the ratio of its population to that of the bordering states is 5 : 6 [2]. This ratio needs careful investigation. The Sudan has eight neighbours, a number that is not surpassed anywhere else in Africa except by the Republic of Congo with its nine neighbours. Furthermore, the Sudan has common boundaries with three of the biggest African states : Egypt, Ethiopia and the Republic of Congo Kinshasa. This may explain the lowering of its ratio of population gradient to the negative group,

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[1] Hamdan, Jamal, *New Africa; A study in Political Geography,* Cairo 1966, p. 103. (Arabic) : Afrikiya Al-Gadidah.

[2] *Ibid.,* p. 106.

while Ghana is among the positive group because it has only three neighbours and a population of seven millions.

The significance of this population gradient, though relative, explains, together with the potentialities of the Sudan, the force of attraction of immigrants from all directions and especially from the west. While the flow of the Nile waters is from the south to the north, there is a human tide flowing west to east, from West Africa across the Sudanese belt to the Holy Lands in Hijaz. The flow of this human tide gathers momentum during the pilgrimage season; and as it crosses the Sudan, it leaves behind enclaves of Westerners in Darfur and Kordofan, whole villages in the Gezira, and scattered groups in Khartoum Province and Kassala Province, where they are concentrated in the towns of Kassala and Port Sudan. It is from this port that they cross the Red Sea to Hijaz. The Westerners in the Gezira have villages with population running into thousands. Maiurno with 14,000 people is an example. As the tide returns from Mecca, a great number of Westerners stay in the Sudan and thus their numbers increase steadily. Here, one can see in the Sudan a median position between West Africa and the Holy Lands.

IV. — THE NATION AND CIVILIZATION.

Unity in Diversity :

I would like to refer once more to Hartshorne and his definition of geography as the study of areal differentiation of the earth surface, and how the study of the ways in which separate areas differ is no less significant than the ways in which they are alike. This is because the study of areas that are somewhat alike, or the study of parts of the same area, can never demonstrate complete similarity; so that when we speak of similar areas it means that minor differences that exist between them are ignored. This is true of similar areas whether defined according to physical or human criteria. The differences that exist between similar and dissimilar areas are differences in degree and not in kind. «Similarity, therefore, is not the opposite of difference but merely a generalization under which differences deemed minor are ignored, those deemed major are emphasized» [1].

«The connections or causal relationships among the phenomena of geography, as Hettner noted in 1905, are of two kinds : the mutual relationships among different phonomena at one place, and relationships or connections between phenomena at different places. The latter necessarily involve movements across areas. Water and air, even pieces of solid material, and, of course, animals, move from place to place producing interconnections of places.

With the introduction of man to the scene, this dynamic aspect in the character of areas becomes far more important; for it is one of the particular attributes of man that he not only moves from place to place himself, but sets other things in motion as well. It is especially in their human aspects, therefore, that areas differ not merely in their morphology, but also in what Ritter called their physiology, but which, to avoid the analogy with living organisms, we had better call their functional relations, involving movement among them» [2].

I have quoted this methodological introduction to the study of ‘ Nation and Civilization ’ because we find in every nation, however small in size, differences in its component parts. Complete harmony is non-existent even between the right and left sides of the human body itself.

I should like also to point to the difference between the study of a certain phenomenon, and the attempt to orient that phenomenon along certain lines. Such orientation might aim at exaggerating and emphasizing the differences within a state with the object of deepening the rifts in its structure; or it might aim towards emphasizing the similarities, leaving them and the divergencies, to co-exist and to be transformed into complementary elements or functional relationships in the life of the state. These differences may by likened to the rocks carried by the river. At the beginning the rocks have sharp angles that may inflict wounds and cause bleeding, but as they are carried

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(1) Hartshorne, 1959, p. 17.
(2) *Ibid.*, p. 19.

further downstream, the angular shapes disappear, and the rocks become smooth and rounded, and finally they are ground into tiny particles deposited as silt that gives life and wealth. The rocks may retain most of their chemical properties but physically they acquire new functions.

In our study of the Sudan we find that whereas area location and size, together with concentration and volume of population are the basis and fundamentals of Sudanese life, they also pose problems and present challenges that must be overcome in the course of progress. The huge size of the Sudan is responsible for diverse ethnic groups, differences in historical backgrounds and ways of life. These problems are the burden of large size states and are to be found in every large country in the world.

On the international level we find the dualism of French and Anglo-American cultures in Canada. If we turn southward we find a complexity of dualism and contradictions in the United States of America : north and south, Whites and Coloureds, Protestants and Catholics, Republicans and Democrats. Still further south in Latin America, we find Spaniards, Portuguese, Mulattoes, Negroes and Amero-Indians, a human jungle into which races flocked from a broad front extending from the islands of Japan to the British Isles, in addition to those coming from North America and Africa. Here, Brazil is a good example.

On the African level, we find in Nigeria, a tripartite set-up of Muslim Hausa and Fula in the north, while in the east there are the Ibos with their African and Christian religions, and in the west the Yoruba with a Christian majority. This is one example from one belt, the Sudanese belt, out of several belts in Africa.

The existence of problems arising from diversity is inevitable, and, if such problems are present in the «New World» we should expect to find them in abundance in the «Old World» with its historical dimension and ancient civilizations. This has led to the crystallization of national consciousness among Asiatic, European and African national groups.

Should these human facts be taken as an excuse for widening rifts or for sowing hatred among groups within a state, then the states

that ought to disintegrate first, should be the giant states of our contemporary world. We have only to count the number of races and sects in the United States of America and the U.S.S.R.

And, if human differences are to be taken as an excuse for the breaking up of political units, then one ought to take physical differences as well. Islands are regarded as separate physical units. Let us imagine what will happen if this physical definition is to be applied to the islands of Japan, the British Isles and Indonesia.

It is not unexpected, therefore, that there are cultural problems in the Sudan ; in fact it would be unexpected if such problems were non-existent, for no country in the world is free from them. The basic question here is : would the attitude of contemporary Africa, now with a population of 256 millions, towards such problems, be the same as it would be when Africa's poplulation reaches 1000 millions?

Civilization and Gateway :

Let us now turn to view the Sudan, on the basis of comparative study, as the zone where the Nile and the Sudanese axes meet.

1. In countries of the Sudanese belt in West Africa we see a marked dualism between north and south. South of the Sahara there are three zones : Al Sahel, Al Sudan and Ghana [1]. The belts of Al Sahel and Al Sudan are dominated by Arab-Islamic culture. The whole of Al Sahel and Al Sudan belts are named «Bilad Al Sudan» by Arab Geographers though recognizing differences between its different parts [2].

There are, therefore, two poles or two summits of civilization in West Africa : the Arab-Islamic pole in the north and the negro pole in the south. The region separating the northern from the southern poles is — relatively — an underpopulated trough lying between the cultural hieghts of the north to the south in West Africa. This

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[1] Trimingham, Spencer, *Islam in West Africa,* p. 2.

[2] Al Mas'ûdi, Meadows of Gold : (*Murug Al-Dhahab*), Cairo, Albahiyya Press, 1346 H., pp. 235-253, under the title : The Sudanese and their Geneologies.

middle area is a region over which both the north and the south are converging.

The first spread of Islam was from the heart of the Arabian Desert outwards; and although the link between the heart of Arabia and the Muslim world has been, and is still, strong, yet the spread of Islam and Arabization was not exclusively the work of the Arabs. The spread of Islam was more like a relay race [1], where the torch is carried by a generation of Muslims to a new land, and from there the people of the new land themselves would carry the torch to yet further lands. Islam was introduced to Egypt from the heart of Arabia, and the Egyptians then introduced Islam to North Africa. The north Africans in their turn carried Islam across the Sahara and into West Africa; and it was the West Africans themselves who were responsible for the penetration of Islam into the depths of the continent. In consequence, the spread of Islam in West Africa was not associated with the desire to dominate people, nor was it the work of intruders from outside the continent. The spread of Islam in Africa did not require the backing of a centralized authority. The march of Islam in Africa has been a purely African affair conducted by Africans in a process of interaction between groups of Africans.

The spread of Islam through the Sahara southwards took place on a broad front extending from the Red Sea to the Atlantic ocean. Caravans carried trade and ideas in three main directions :

a) horizontal directions connecting the Atlantic with the Red Sea and the Indian Ocean,

b) vertical directions connecting the core areas of civilization on the opposite sides of the Mediterranean and the Sudanese belts, and,

c) circular routes connecting the circumference of the huge ring round the Sahara.

(1) HAMDAN, J., *op. cit.*, p. 270.

The study of these routes, their historical development and geographical extent was made by Bovill [1]. The subject was carefully studied by a number of Arab geographers and historians like Qalqashandi [2], Ibn Battuta [3] and Al Bakry [4]. Abdul-Majeed Abdeen's study of these routes is restricted mainly to cultural contacts between Egypt and the Sudan along the Nile route [5].

Arab-Islamic influence had, therefore, penetrated the Sudanese belt mainly through the northern gateways. There had been, however, some interactions between the northern and eastern gateways, between overland Islam introduced by nomads and caravan men, and maritime Islam introduced by Arabs of the South during their seafaring. It was Islam coming from the north that moulded the whole of the Sudanese belt into one cultural pattern.

2. Then there are the differences in the distribution of land and water masses in East and West Africa. The West African landmass ends at latitude 5° N., while in East Africa it extends as far as latitude 35° S. — a difference of 40 degrees of latitude. Thus, after the Portuguese had first tried to sail round Africa, they and other Europeans began to debark at West Africa. It was the Guinea coast that was the first region to be destructively exploited by Europeans, resulting in a vast drainage of human and natural resources. European missionaries and trade companies were attracted to West Africa, and new centres of European civilization were established in the south where missionaries became active, while the inner north, relatively

(1) BOVILL, E.W., *The Golden Trade of the Moors,* London 1961. See also : FAGE, *op. cit.*

(2) AL QALQASHANDI, Abul Abbas Ahmad, *Morning of the Dim-Sighted,* Cairo, The National Library, 1920, vol. 5, p. 62. (Arabic) : *Subḥ Al-'Al'a'sha.*

(3) IBN BATTUTA, Abu 'Abdi Allah Muhammad, *A Revised Version of Curiosities for Sight-Seers in Strange Lands.* Cairo 1934. (Arabic).

(4) AL BAKRY, Abu 'Ubaydi Allah, *The Wonders in Africa and Morocco,* ed. by Slame, Paris 1411 (Arabic). See his care in mentioning distances in the Sudan, pp. 172-183.

(5) ABDEEN, Abdul-Majeed, (Editor), *Accounts and Explanations of the Arabs in Egypt by Maqrizi,* Cairo 1961. (Arabic) : *Al-Bayan Wal-I'rab.*

recoiled behind its solid, protective Islamic shield. European imperialism having failed to destroy this shield on the Mediterranean shores, had tried to encircle it from the south. Thus a new power rose in the south that was religiously and culturally different from that in the north. The poor, middle belt became, as mentioned before, a land of convergence between the north and the south.

3. The situation in the Sudan was quite different, because the main gateway into the Sudan was, and still is, the northern land and sea gateway, through which both Arab-Muslim as well as European influences have been diffused. Europe entered southern Sudan through the north and not through encircling the Sudan from the south, though there was a struggle between the European powers for the control of the equatorial sources of the Nile, resulting from eastern and western attempts of European penetration into Africa. Arab and Muslim influences entered southern Sudan before the advent of Europeans; in fact, cultural links along the whole of the river from source to mouth may be dated as far back as the times of ancient civilization [1].

Thus, southern Sudan had not been an unknown land when European influence first came. Rather, it was European influence that attempted to make it forbidden land once it had settled there. It actually planned to cut all other links except its own; for these links would have enabled this area through the natural processes of gradual evolution and interactions with other international settings, as well as evading many historical contradictions. Then the road would have been paved for the establishment of new functional relationships.

This shows how the effect of European influence on southern Sudan has been markedly different from this influence on the southern parts of West Africa. For, in those parts the interaction was only dual, an interaction between conventional ways of life and the invading European culture. But in southern Sudan the interaction was tripartite

(1) SELIGMANN, C. G., *Frazer's Memorial Lecture* (1934). The whole lecture is devoted to this subject.

involving the old conventional ways of life, the Arab Muslim influence, and, later, the invading European culture.

4. While the northern sections of west Sudan were relatively more stable, the other sectors were seething with conflicts resulting from the fact that they were a front upon which blew the winds of culture, stormy at times, and breezy at others.

In this respect northern Sudan was not much different from Egypt and the other coastal countries of Maghrib, being gateways through which European influences came, as well as being at the same time fronts upon which raged the struggle with imperialism for liberation. In other words, while the southern parts of West Africa were completely stormswept by European culture, the northern parts were partly safe from it. Similarly, the northern parts of the Sudan were not saved from the full impact of western culture, but the southern parts only partly succumbed to that influence.

5. It is to be remembered that in West Africa, there is that rarefied central strip which was practically a cultural and demographic trough between the two poles. Turning to the Sudan, the continuity of the population spread from the north to the south is uninterrupted. The situation would have been different were the southern races living only south of the Sudd, and the northerners living only to the north, the Sudd being in this case an area of rarefied population splitting the Sudan into what may be called distinctly north and south. But the region of the Sudd is in the heart of the south, where no barriers interrupt the geographical continuation of the area from the Ethiopian slopes to west Sudan eastwards. So, the geographical conditions would encourage such exchanges between races, and this has been vindicated by the facts of history. Thus, if we take the White Nile as an example, we find that tribes of Ja'aliyin and Kawahla living up to latitude 12° N. and roaming southwards even to the west of the river [1]. The homes of the Nilotic people begin

(1) ʿAWAD, Mohammad, *Northern Sudan : Its Population and Tribes,* Cairo 1951, fig. 12, p. 149. (Arabic) : Al-Sudan Al-Shamali : See Also, =

from the Dinka to east of the White Nile up to the Shilluk in the west, with no natural barriers, resulting from geomorphological forms or climatic or vegetation differences justifying any grounds for distinctions between these people. The use of the word «*begin*» here is more approximate than precise, because such meeting up of races could more precisely be described as a form of diffusion where traits and cultures are communicated through co-existence and intermingling.

Thus, there is a clearly osmotic diffusion between the heart of the Sudanese ecumene and its peripheries. This is seen both in the homeland of the Beja in the east — where I had the good fortune to stay and to be engaged in research —, in the Nubian Nile area, as well as in the west and south. The ability of the Sudanese heart to fuse cultural influences is conditioned by such factors as the system of communication, the readiness for quick response. Above all, there is the paramount sense of actual existence in, and belonging to, an Arab Muslim nation and sharing with it the same destiny.

It is in this light that should be viewed the results of geographical distributions on the different cultural gateways and their bearings on the Sudan as a «*nation*».

Cultural Contacts :

If we look beyond the northern land and sea gateways of the Sudan, the majority of its population form an integral part of a bigger world, the Arab world encompassed by the Muslim world. The muslim world, as a whole, forms a median continent between the traditional continents of the old world, and the Arab nation is the core of this intercontinental continent.

Throughout its history, the Sudan has been — by virtue of its position — one of the fronts of the Arab and Muslim world; and such peripheral states have their natural problems. These problems seem to be historically determined, unless these countries have well

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Butt, A., *The Nilotes of the Anglo-Egyptian Sudan and Uganda,* London (N.D.). Compare the map here with that presented by ʿAwad, *op. cit.* Fernau, F.W., *Moslems on the March,* London 1955, p. 19.

defined natural frontiers. The meeting-place between land and water may be, sometimes, the best line of demarcation.

So, the position of the Sudan is of double importance : it occupies a median position in Africa, and its position is crucial to this vast expanse of land. The following example from the Republic of South Yemen is revealing, since the south border of this Republic is the Arab sea, which — besides being a natural border — is also a border for the big Arab and Muslim mainland. So, there is a coincidence of the three different kinds of borders : natural, Arab and Muslim. It may even be said that here we have four different borders, if we take the racial question into consideration. This applies, relatively, in a similar way to the natural border of the Sudan, the Red Sea.

But the Sudan with its ecumene : the nucleus, the various extensions, the human archipelago in the south, and the Nubian human wedge in the north, has the coincidence of three different borders : the Arab, the Muslim and the political border. These boundaries are not well-defined lines; rather, they are some type of planetary diffusion where no rigid fronts or boundaries are discernible; but the whole region has an integral character resulting from the same linguistic and religious traits. Probably the north is more representative of this unified character than the rest of the Sudan.

Some of the ideological factors which determine this cultural setting are :

1. The tolerance of Islam and its guarantees for the freedom of belief : «There is no compulsion in religion» (2-256). The example for this freedom of belief may be found in Egypt, where Islam and Christianity have co-existed for centuries with the deep belief in a united nation free from imperial domination.

2. The stand of Islam towards the colour problem : «O mankind! Lo! We have created you from male and female, and have made you nations and tribes that ye may know one another. Lo! the noblest of you, in the sight of Allâh, is the best in conduct. Lo. Allâh is Knower, Aware» (49-13). These and other verses of the Qur'an bespeak the basic belief, according to Islam, in humanity as

one nation : ‘ O mankind ! Be careful of your duty to your Lord Who created you from a single soul and from it created its mate and from them twain hath spread abroad a multitude of men and women. Be careful of your duty towards Allah in Whom ye claim (your rights) of one another, and towards the wombs (that have bore you). Lo ! Allah hath been a Watcher over you» (4-1).

3. Islam emphasizes the dignity of man, and it also stresses a similar respect for land as it is the sphere of his activity. «Thereof (from the earth) We created you, and thereunto We return you, and thence We bring you forth a second time» (20 — 55). To this fact the Qur'an again refers in the verse, «He it is Who hath made the earth subservient unto you, so walk in the paths thereof and eat of His providence. And unto Him will be the resurrection (of the dead)» (67 — 15).

Such is the stand of Islam towards man and his environment, an attitude which is basic to any geographical study of this area, and of all cultural relations there.

It is also in this light that we can realistically evaluate what Arab geographers have written about different nations. In this respect it seems appropriate to quote the following passage from Al Masʿūdi in his book «The Meadows of Gold». He begins by pointing out to these nations, belief in God, and then goes on to say, «The negroes are an eloquent people. Their orators may stand for a long time admonishing them to be obedient to their Creator, and to fear his punishment, all the time reminding them of their ancestors and of their past mighty kings» [1]. So, it seemed that the general policy of these writers was one of objective and equitable judgments.

Now, with the renaissance that is taking place everywhere in the Sudan, it seems necessary that many long-held notions coming from alien cultures will be re-evaluated ; many of the books will also be looked upon in a new light, and new studies will emerge. With the newly evolving cultural patterns resulting from ever enriched

[1] Al Masʿudi, *The Meadows of Gold,* vol. I, p. 244.

reactions between the people of Africa and their African environment with its political and cultural currents (both regionally and nationally), will develop the new traits of the African identity.

The streaks of this new dawn of intellectual awakening are already visible, and with the new light will come out new hopes, to be translated — through knowledge, belief and tolerance — into solid facts and realities.

CONCLUSION

The main thesis of this paper, has been that the geographical personality of the Sudan is, at the same time, a scientific, technical, and practical product. Such a personality is already determined for the past, but it is still open to so many possibilities in the future. If it implies a historical dimension, it is this dimension that is needed for its upward ascent at the present juncture of its history.

I have also tried to present some of the aspects or features of the Sudanese personality chosen from the facts of geography in comparison with the continental cultural structure as a whole. The main line of argument is the median position of the Sudan. To this median position, one may add also — as a final footnote — the Sudan's politically median stand, with its role of successful mediation in many Arab crises. This personality of the Sudan on the Arab plane has had both its geographical and historical justifications.

GEOMORPHOLOGY OF THE WESTERN DESERT MARGIN BETWEEN SOHAG AND NAG HAMADI EGYPT

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ABSTRACT

The morphology of the desert area west of the Nile Valley between Sohag and Nag Hamadi has been conditioned both by structure and a changing local base level relative to the Nile. The main structural feature in the area is manifested by a definite zone of crustal weakness consisting of a number of northwest to southeast trending breaks. Tectonic deformation along this zone may have started during the late phase of Alpine Orogeny, and resulted in the formation of two embayments on sunken land blocks in conjunction with the larger trough which was later occupied by the Nile. A subsequent episode of late Pliocene deformation was mere revival of movement on the hypogene fractures that were buried during Pliocene aggradation. This latter movement brought up to the surface lime-charged ground water in numerous springs where embankments of tufa were precipitated about fault breaks at the center of both embayments.

Although the broad outlines of topography were determined by early tectonics, subsequent phases of sculpture of landform details were mainly guided by the structural attributes of various rock types. Fractures, joints and cracks as well as other physical and chemical characteristics of component rocks are reflected in drainage patterns and valley forms. For instance, a majority of the wadis in the limestone plateau are oriented toward the northwest or the southeast following the structural grain of the country. Rectangular and angulate drainage patterns are transmitted from joint systems and fracture zones in massive limestone, whereas dendritic and braided patterns dominating clastic rocks within the embayments are determined by the regional slope of the surface. On the other hand, resistant horizons of hard silicified layers in the limestone plateau

are expressed by a series of successive erosion surfaces forming the top of the plateau, and by numerous breaks in longitudinal valley profiles that appear as dry waterfalls obstructing wadi courses.

The general downcutting tendency of the Nile during the Pleistocene has steadily lowered the local base level of side wadis, and has augmented degradation within the valley borderlands. Therefore, the Pliocene surface of the embayments has been considerably reduced and the resultant erosional plain assumed two distinct levels separated by tufa embankments. The upper plain level occurs upstream from the resistant tufa barrier which protected it from further erosion, whereas prolonged degradation reduced the plain surface down valley from the barrier to its present low level. Degradation was, however, interrupted by minor phases of aggradation of which the earliest phase is represented by a series of red sand beds unconformably overlying Pliocene sediments. Subsequent phases of deposition contributed a younger fanglomerate fringe at the edge of cultivation.

Eolian deposits in the area are related to topographic obstacles interrupting the movement of blown sands brought from adjacent sources by north-western winds. Several forms of sand shadows and sand drifts are found on the plateau front and within its steep valleys. A dune belt composed of ten brachans occurs in the lee of the plateau headland west of Sohag.

The efforts of man to utilize available resources have already established an appropriate pattern of land use both in agriculture and settlements. People took advantage of underground water to irrigate marginal land acquired from the desert, and constructed their villages and hamlets there to limit the encroachment of settlements over fertile lands. Nevertheless, expansion was always defeated against the unyielding fanglomerate fringe, which in many instances put a sharp boundary between the oekumene and the desolate desert. Man may be able however, to win, in part, the battle between the desert and the sown by applying his modern techniques in reclamation and irrigation.

TOPOGRAPHY

The mapped area covers some 2500 square kilometers of the desert skirting the Nile Valley from the west between Sohag and Nag Hamadi (Fig. 1). The western portion of this area is a tableland elevated about 330 meters above sea level, and is part of the extensive limestone plateaus bordering the Nile Valley on both sides for approximately 660 kilometers

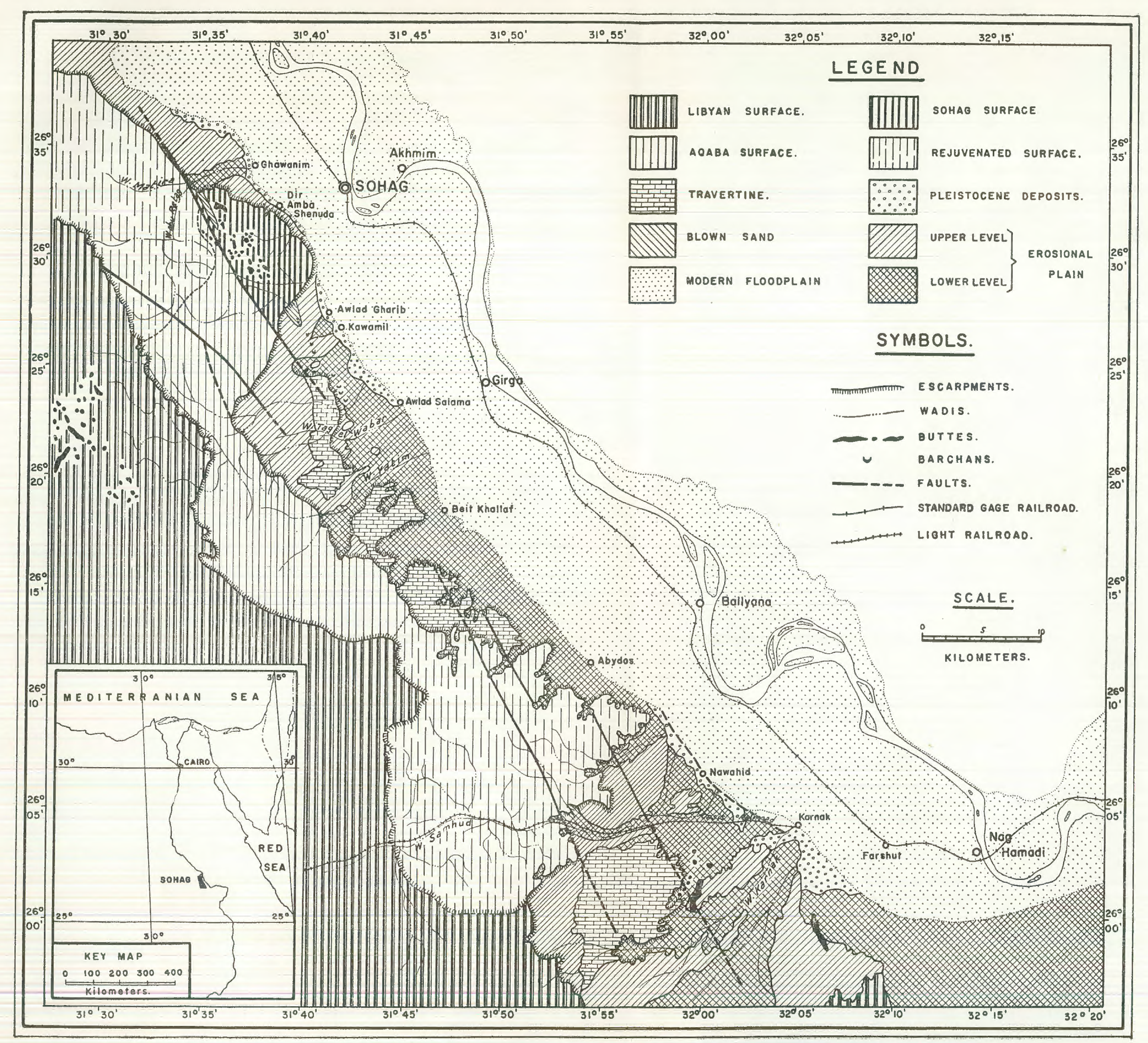

LEGEND
LIBYAN SURFACE.
SOHAG SURFACE
AQABA SURFACE.
REJUVENATED SURFACE.
TRAVERTINE.
PLEISTOCENE DEPOSITS.
BLOWN SAND
UPPER LEVEL
LOWER LEVEL
EROSIONAL PLAIN
MODERN FLOODPLAIN
SYMBOLS.
ESCARPMENTS.
WADIS.
BUTTES.
BARCHANS.
FAULTS.
STANDARD GAGE RAILROAD.
LIGHT RAILROAD.
SCALE.
0 5 10
KILOMETERS.
Akhmim
SOHAG
Ghawanim
Dir Amba Shenuda
Awlad Gharib
Kawamil
Girga
Awlad Salama
W. Yatim
Beit Khallaf
Baliyana
Abydos
Nawahid
Karnak
Farshut
Nag Hamadi
W. Samhud
W. Karnak
MEDITERRANIAN SEA
CAIRO
RED SEA
SOHAG
KEY MAP
0 100 200 300 400
Kilometers.
31° 30'
31° 35'
31° 40'
31° 45'
31° 50'
31° 55'
32° 00'
32° 05'
32° 10'
32° 15'
32° 20'
26° 35'
26° 30'
26° 25'
26° 20'
26° 15'
26° 10'
26° 05'
26° 00'

Figure 1

between Cairo and Qena. The edge of the plateau, in the area here considered, is marked by a precipitous escarpment rising abruptly more than 120 meters above a low desert belt to the east. Ascent from the valley floor to the upper surface of the plateau is, therefore, impossible except along certain camel tracks well known only to the wandering nomads of the desert. Three salient headlands extend from the plateau towards the Nile to reach the edge of cultivated land west of Sohag and Abydos, and again south of Farshut. Between the headlands a low desert surface penetrates from 15 to 25 kilometers into the plateau, forming two great triangular embayments of which the northern will be referred to as the Girga Embayment and the southern as the Samhud Embayment.

The area is characterized by modest relief as the difference in elevation between the top of the plateau and the level of the modern floodplain of the Nile in the immediate vicinity does not exceed 300 meters. A tremendous number of dry wadis that drain the desert and eventually reach the Nile include from south to north : Wadi Karnak, Wadi Samhud, Wadi Beni Hamil, Wadi Dokhan, Wadi el-Yatim, Wadi Tag el-Wabar and Wadi Abu Retag, in addition to countless smaller water courses of which the majority bear no names. Under present dry climate, this channel network seldom flows with water to the extent that enormous bodies of eolian sand choking the courses of wadis, particularly in the limestone country, have remained almost undisturbed by floodwash over considerable time spans.

STRUCTURE

Rock types :

The tableland comprising the western part of the area is composed of Lower Eocene limestone known as Thebes Formation [1], of which the upper 200 meters are exposed above the surface of the embayments. This series consists of soft white limestone and chalk beds alternating with resistant silicified layers at different horizons. The hard beds

(1) Rushdi Said, *The Geology of Egypt* (Elsevier Publishing Company), Amsterdam, 1962, pp. 88-93.

constitute an important element in the geomorphology of the limestone country as they give rise to the action of differential weathering and selective erosion, and above all, as they act as temporary base levels towards which the land masses above them are being degraded. The attitude of the starta is nearly horizontal throughout, except where they are disturbed by faults, slight dips and flextures may occur.

The greater part of the embayment floors is covered with Pliocene clastics including hard conglomerate layers with abundant quartz pebbles, and brown or blue marls laminated with fine sand. Pure white limestone beds occur toward the upper margins of the embayments, whereas thick travertine deposits line hillslopes at the center of both embayments.

The Pliocene clastics cover a greater surface in the area under investigation than that shown on the authorized geological map [1], in which a considerable area mapped as Pleistocene deposits is, in fact, a truncated Pliocene surface masked under thin veneers of red sand or younger gravels of local origin. Brown marls, similar to those assigned Pliocene age by Sandford in lower Wadi Qena [2], can be obtained almost everywhere from shallow pits at a distance of three kilometers west of the edge of cultivation. It is interesting to mention that shrewd land tillers have discovered this geological fact a long time ago when they used the nitrate —containing marl as a natural fertilizer before the introduction of chemical fertilizers in Egypt.

Travertine deposits overlie Pliocene sediments in a discontiguous belt at the center of embayments where they appear from a distance as enormous embankments of weathered-black material forming a low, north-south escarpment about 35 meters high. In many places, the escarpment has been severely dissected, and as it receded, small outliers of steep-sided buttes (Plate I, A) have been isolated by the courses of deep ravines. On the whole, the lava-like travertine is highly porous as it usually contains cavities of various dimensions attributed to some impurities that were embodied in the tufa during deposition, and which were

[1] *Atlas of Egypt,* Egyptian Government Press, Survey of Egypt, 1928, Plate 10.

[2] Kenneth S. Sandford, « The Pliocene and Pleistocene Deposits of Wadi Qena and the Nile Valley between Luxor and Assiut», *Quaterly Journal of the Geological Society,* vol. 85, 1929, p. 508.

later washed away. Massive and root-like structures are common, and in certain localities the calcareous deposits are crowded with peculiar impressions of leaves and twigs and casts of stems of unidentified flora. The tufa may also appear in a stratified form consisting of successive, compact layers, each a few centimeters thick suggesting definite interruptions in the course of deposition which were probably related to seasonal or periodical fluctuations in the flow of the artesian regime that precipitated the tufa.

Concerning the origin of tufas in this area, it is interesting to note that their distribution is restricted to a definite zone cut by faults where lime-charged ground water was forced up to the surface in numberless seeps and springs around which marshes were formed. Evaporation from the resultant water surface caused slow precipitation of the calcareous material that embodied masses of the existing flora. This means that at the time of their formation, this part of the Nile Valley was dry land following the withdrawal of the Pliocene Gulf which received earlier subaquaous deposits. The age of travertine deposition, is therefore, Late Pliocene, and the process may have continued well into early Pliestocene times. No Pleistocene gravels were seen to cut across the travertine ridges as postulated by Sandford [1].

A series of red sand beds, well cemented into fine-grained sandstone at top, unconformably overlie Pliocene conglomerate with a total thickness of three meters upstream from the travertine escarpment. Eroded remnants of the same sands are seen again capping parts of marl outliers toward the lower reaches of the embayments, particularly west of Awlad Salama and South of Karnak. With the exception of these sediments, which are probably of lower Pleistocene age, the 100-foot terrace of lower Paleolithic age reported in the area by Sandford [2], is actually non existant. It seems that the sands were derived, during a dry phase of accelerated erosion, from residual red soils which had formerly covered the surface of the limestone plateau.

[1] *Ibid.,* p. 534.

[2] Kenneth S. Sandford, *Paleolithic Man and the Nile Valley in Upper and Middle Egypt.* The University of Chicago Institute Publications, vol. 18, 1943, p. 29.

Younger Pleistocene sediments consisting mainly of thick fanglomerate beds appear at the surface within a narrow belt not more than two kilometers wide along the edge of cultivation. The following section was recorded from a recent gravel pit immediately southwest of the abandoned Oasis Railroad Station at Karnak :

	Meters
1. Eolian Sand	0.4
2. Alternating layers of loose sands and pebbles	2.3
3. Fine-grained fanglomerate with interfingering seams of sand............	2.0
4. Gobble fanglomerate in red sand matrix	1.1
5. Well-cemented coarse-grained fanglomerate with quartz sand	1.2+
Base unexposed.......	7.0+

The topographic position of these sediments at a level six to nine meters above recent floodplain mud places them in the 30-foot terrace stage assigned a middle Paleolithic age by Sandford [1]. This terrace consists, for the greater part, of local gravels brought down from the neighbouring limestone plateau by a host of east-flowing tributaries, in addition to Nilotic sands transported and deposited by a north-flowing river (Plate I, B). In certain places where local tributaries are lacking, this level consists entirely of a series of false-bedded Nilotic sand dropped appropriately by the Nile to maintain a graded course. A type locality occurs along a seven kilometer stretch between Dir Amba Shenuda and Nag el-Ghawanim west of Sohag. At Dir Amba Shenuda, eight meters of quartz sand beds extend from the foothills of the Eocene cliffs to the fields where they pass under recent Nile mud.

Farther north, these sands appear again at the desert margin for several kilometers and are interrupted only at Nag-el-Ghawanim where Wadi Abu Retag has constructed a sizable alluvial fan protruding into the cultivated belt. It will be seen later, that these sand embankments, located upwind from the plateau headland west of Sohag, have furnished

[1] *Ibid.*, p. 75.

ample sand source for eolian deposites now engulfing the windward scarp of the plateau, and forming sand drifts and barchan dunes farther south (Plate II, A).

FAULTING :

A number of British geologists have long denied, or at least underestimated the role of faulting in guiding the course of the Nile, and in determining the position and form of its valley within the limestone plateaus in Egypt. Nevertheless, presence of marginal faults in the bounding limestone cliffs was known to Beadnell [1] as early as 1901, but his views were at once rejected by Ball [2] who claimed that deformations such as those reported by Beadnell were mere landslips having no significance in the configuration of the Nile Valley which he attributed to the sole action of river erosion. A few years later when Lawson reported the occurence of down-faulted blocks in a number of localities along the sides of the valley between Luxor and Manchea [3], Sandford, adopting the earlier views of Ball regarded Lawson's Kernbuts as superficial slipped blocks of pre-Pliocene age [4]. On the same subject Hume wrote that longitudinal faults parallel with the Nile Valley and which have supposedly affected its form, are less frequent than transverse fractures across its course. But in the meantime, Hume recognized a certain amount of structural control in the formation of the valley when he suggested two sets of folds that may have guided the erosive process during the early stages of excavation of the Nile gorge [5].

[1] H. J. BEADNELL, « Découvertes Géologiques dans la vallée du Nil et le désert Libyen, Congrès Géologique International, VIIIe Session, Comptes-rendus (Paris, 1901). Review in : *Geological Magazine,* January, 1901, vol. 38, p. 28.

[2] J. BALL, « On the Origin of the Nile Valley and the Gulf of Suez», *Geological Magazine,* vol. 47, 1910, pp. 75-76.

[3] Andrew G. LAWSON, « The Valley of the Nile», *University of California Chronicle* vol. 29, 1927, pp. 248-251.

[4] SANDFORD (1929), *op. cit.,* pp. 500-501.

[5] W. F. HUME, « The Surface Dislocations in Egypt and Sinai, their Nature and Significance», *Bulletin de la Société Royale de Géographie d'Egypte,* vol. 17, 1929, pp. 1-11.

It seems that opponents of faulting have based their views upon the scarcity of verified faults which was, actually owing to lack of field observation and detailed mapping at that time. Recent investigations have, however, altered the former views, and the effect of faulting in determining the path of the Nile in many districts is becoming an established fact. For instance, Said and Issawy have recently shown the occurrence of faults that guided the courses of the Nile and its tributaries of dry wadis in the sandstone country of Lower Nubia [1]. Moreover, linear structures described by Yallouze and Knetsch imply the presence of a major zone of northwest-trending fractures which extends several hundred kilometers between Bahareya Oasis and the Red Sea Hills, and which crosses the Nile Valley south of Manfalout [2].

The area considered here adds more evidence to the occurrence of faulting and recurrent tectonic activity in the immediate vicinity of the Nile Valley in this part of Upper-Middle Egypt. A major structural zone consisting of a number of northwest trending breaks belonging to the African or Erythrean fault system dominates the limestone country, and continues through the low desert surface within the embayments. One of the main fractures of this system cuts across the plateau west of Sohag causing conspicuous flexing of the strata in a zone about two kilometers wide as seen from the edge of the plateau due west of Kawamel. Vertical displacement of some 40 meters is deduced from variation in surface levels between the down-faulted headland on the east and the uplifted block on the west. Movement took place along this fracture in late Pliocene and early Pleistocene times as the whole sedimentary series of the Pliocene infilling near the head of the Girga Embayment was involved in the uplift. Furthermore, the movement entailed the formation of springs within the faulted zone about which tufa deposits were precipitated. The stratigraphic position of the tufa relative to underlying Pliocene sediments confirms the age given above to the movement.

(1) Rushdi Said and Bahay Issawy, « Preliminary Results of a Geological Expedition to Lower Nubia and to Kurkur and Dungul Oasis, Egypt», Museum of New Mexico Press, Santa Fe, New Mexico, 1964, pp. 6-8.

(2) Mayer Yallouze and George Konetsch, « Linear Structures in and around the Nile Basin, (Comparative analysis of tectonic evolution in North Africa)», *Bulletin de la Société de Géographie d'Egypte,* vol. 27, 1954, pp. 176-177 and 195.

Another important group of fractures belonging to the same structural zone and having the same nature and trend appear in the Samhud Embayment south of Abydos. A major difference is however, indicated by a moderate horizontal component of the movement particularly along the easternmost break where right-lateral displacement has offset the limestone ridge of Kolet el-Kataya about its southern edge. The horizontal displacement amounts to 80 meters, and the fault trace is marked there by a zone of pulverized rocks cutting across the ridge. Another example of lateral deformation on the same fault is shown by the offset channel of lower Wadi Samhud. On the western side of the fault plane, the channel has been shifted to the south, and part of the drainage was thus diverted to a new channel followed by the Oasis Railroad. Vertical displacement associated with this fault resulted in the uplift of Pliocene sediments north of the trunk channel of Wadi Samhud some 45 meters above the general level of their counterpart further east, hence, a late Pliocene or early Pleistocene age is given to the movement. Travertine deposits appear again within the faulted belt here, and are of the same age and origin as those found in the Girga Embayment.

Evidence of recent movement is well displayed along the lower reaches of the Samhud Embayment. From Abydos southwards, the desert margin has been uplifted approximately 10 meters above the cultivated land as manifested by a northwest to southeast fault scarp. The movement is so recent that Pleistocene gravels were involved in the uplift. Therefore, the lower channels of wadis crossing the uplifted belt are currently cutting prominent gorges in the Pleistocene gravels keeping pace with the movement and surviving as antecedent streams.

Observations so far made indicate that the northwest to southeast lineament follows a definite system, and occur within a broader area than that postulated by Yallouze and Knetsch. In addition to the fracture zone here identified, faults belonging to this system occur elsewhere in both sandstone and limestone plateaus bordering the Nile Valley from Wadi Halfa to Helwan [1].

(1) Hume, *op. cit.,* p. 9 ; and Sandford (1934), *op. cit.,* p. 7, and Fig. 2 ; and Said (1962), *op. cit.,* p. 35 ; and Said and Issawy (1964), *op. cit.,* pp. 6-8.

Concerning the age of faulting, it seems that the northwest structural zone in the area under consideration, was in existence prior to Pliocene sedimentation, and has undoubtedly played a role in the initial configuration of the surface features. Differential movements of land blocks among the fractures during the late phase of the Alpine Orogeny resulted in subsidence of parts of the Eocene plateau bounded by the headlands, hence the formation of the embayments. But the broad topographical outlines, thus determined, were substantially modified by phases of sliding and denudation before the embayments acquired their present shape. Subsequent episodes of deformation resulted from revival of fractures along the old zone of weakness, of which the latest movement is probably continuing at the base of the Samhud Embayment.

In view of the relatively flat terrain characterizing the Nile border lands, limited displacements associated with minor fault systems are highly significant in modeling surface features wherever they obtain. Within the limestone plateau, limited differential movements on small fractures have individualized the geomorphic evolution of this district in terms of small unit areas, or even individual basins. In this respect, valley forms, stream patterns, and texture of topography vary according to rock types and the nature and magnitude of tectonic deformations.

DRAINAGE

The Limestone Plateau :

From a distance, the top of the plateau appears to be remarkably flat, but closer examination shows that the greater part of the upper surface is, in fact, trenched by a multitude of large and small canyons that had virtually left no part untouched. Solution along intricate joint systems grooved the bedrock surfaces of inter-stream flats developing numberless rills and gullies, whereas other areas, known as melon desert, are covered with solution residuals consisting of well-rounded lag boulders of weathered-black flint. Scores of small caves marking old pass ways of subsurface water are found everywhere opening on valley sides at different levels.

Drainage lines heading in the plateau descend to the embayment floors in a number of steps, or rather dry waterfalls related to the varying resistance of limestone beds. Potholes are common along the major courses and at the base of the main scarp where a few streams are forced by a hard silicified layer to descend a step 40 meters high before entering the low embayment floors. Another stage of this process is encountered where tributaries that failed to join master channels in complete accordance appear as hanging valleys, some of which form sizable notches serrating the upper edges of valley sides a hundred meters or more above wash beds. Nevertheless, the wadi system is well integrated and drains the eastern slopes of this part of the Egyptian Western Desert thoroughly.

A rectangular drainage pattern dominates the greater part of the plateau where both master channels and their tributaries make conspicuous right-angled bends (Fig. 2, C). Obviously this pattern is controlled by the structure as main trunks and primary tributaries follow northwest-southeast structural joints and fracture planes, whereas secondary tributaries and smaller gulches take advantage of minor joints or cracks intersecting the former set at right angles. A variant of the rectangular pattern is the angulate drainage in which parallelism due to fractures and joints exists, but the joinings form acute or obtuse angles [1]. This pattern appears in a large district, particularly in Wadi Tag el-Wabar and Wadi el-Yatim basins. While the main courses of both wadis follow the grain of the country, their tributaries being determined by secondary weakness zones, join the main channels at varying angles (Fig. 2, E). However, the lower basin of Wadi el-Yatim deviates from the angulate drainage and forms a trellis-like pattern differentiated from the rectangular pattern on the basis of elongated secondary tributaries which parallel the main wadi for considerable distances before joining it immediately upstream from the scarp (Fig. 2, F).

It should be clear, however, that the structural elements mentioned above are by no means the only controls since quite a few west to east wadis cut across the grain of the country. The latter group includes the

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[1] E. R. Zernitz, «Drainage Patterns and their Significance», *Journal of Geology*, vol. 40, 1932, p. 517.

trunk channel of Wadi Samhud and the upper course of Wadi Abu Retag and its western tributary known as Wadi Matira. These wadis are probably inherited from a former pattern imposed on the present structure.

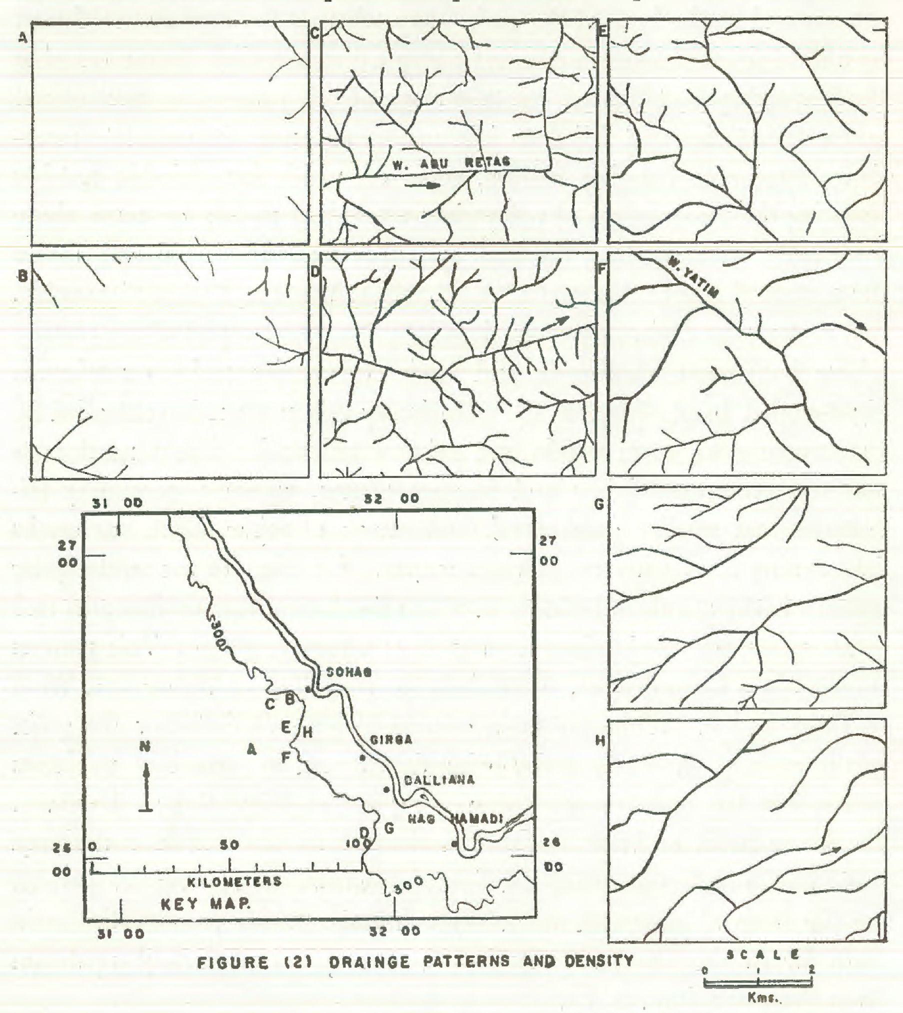


FIGURE (2) DRAINGE PATTERNS AND DENSITY

A barbed pattern appears in the middle course of Wadi Samhud where a number of small tributaries join the master channel with bends pointing upstream (Fig. 2, D). This form suggests stream piracy and drainage reversal from west to east at a comparatively recent date.

Middle Wadi Samhud issues from the limestone plateau through a deep gorge four kilometers long and about one hundred meters wide on the average. Precipitous rock walls rise from 80 to 100 meters above wadi bed, but a short distance upstream from the western end of the gorge, the canyon sides recede and the wadi changes to a broad wash cut along the axis of a shallow depression of probable synclinal origin. A great number of tributaries entering this wash have developed a centripetal drainage pattern typical of closed up basins. At one time, part of the present course of Wadi Samhud in the gorge area was a west-flowing tributary debouching onto the bottom of the depression. On the opposite side of the devide, an active east-flowing ravine cut its way back across the faint divide and captured the former tributary. A water gap was thus formed through which the drainage of the interior depression was finally diverted toward the Nile Valley.

Although climate and rock types are almost uniform throughout, the intensity of water erosion as manifested by stream dissection varies considerably. In other words, the texture of topography expressed by drainage density and stream frequency [1] assumes three distinct grades that may be readily appreciated from direct examination of photomaps or large scale topo sheets (compare maps in Fig. 2). To determine these grades quantitatively, stream density and frequency as devised by Horton were calculated for sample areas each encompassing 20 square kilometers as shown on the index map (Fig. 2). Results are given in table 1.

The lowest density and frequency values are recorded from the western peripheries of the area, and are associated with an old erosion surface capped by resistant layers in which the effect of stream erosion vanishes as one proceeds westwards (Fig. 2 and table 1, A). This surface, which may be termed the Libyan surface, is delineated from the east by an erosion escarpment marking the edge of the hard beds at about the 300 meters contour line (Fig. 1). The scarp extends continuously for more than 65 kilometers and may be seen towering above the main escarpment in the distant background from any position on the highway between Sohag and Ballyana. The upper surface of this high level is characterized

[1] Robert E. Horton, « Erosional Development of Streams and their Drainage Basins; Hydrographic Approach to Quantitative Morphology », *Bulletin of the Geological Society of America*, vol. 56, 1945, pp. 283-285.

TABLE I.

Stream Frequency and Drainage Density of Eight Sample Areas
(Length in kilometers)

AREA	N	L	F	D
A. Libyan Surface west of Wadi Yatim Basin .	4	3.10	0.20	0.15
B. Sohag Surface	24	9.30	1.20	0.46
C. Middle Wadi Abu Retag Basin	80	51.75	4.00	2.58
D. Middle Wadi Samhud Basin	103	46.70	5.15	2.33
E. Aqaba Surface west of Wadi Tag el-Wabar.	35	30.30	1.75	1.51
F. Wadi el-Yatim Basin	28	29.25	1.40	1.46
G. Samhud Embayment Southeast of Nawahid.	44	31.40	2.20	1.57
H. Girga Embayment Southwest of Kawamil .	20	25.50	1.00	1.27

N = number, L = length, F = frequency, D = density.

by a senile appearance typical of the old peneplain of the Western Desert. Drainage lines follow poorly-defined courses wandering among isolated conical hills and elongated mesas which represent erosion remnants of a former higher surface. The greater part of this country is bare bedrock locally mantled with veneers of rubble or eolian sand. At the bases of buttes and mesas dotting this fossil landscap, numerous enclaves of quartz sand beds well-cemented with lime are found.

The landform expression and texture of topography displayed by the plateau headland west of Sohag, here termed the Sohag Surface, resemble in every respect the Libyan Surface. Although water courses are scarce (Fig. 2 and table 1, B) at present, traces of a formerly well-developed stream system are encountered everywhere on the upper surface of the headland. The drainage network was destroyed following the latest tectonic episode in which the downfaulted headland subsided approximately 40 meters. As a result of subsidence, stream gradients and consequently water sculpture were greatly reduced, but channels were not

completely inactivated until the main trunks, particularly those descending the northern scarp, became sites of accelerated eolian deposition. Enormous sand bodies engulfed wadi embouchures along with the windward scarp of the Sohag Surface (Plate II, A). As the encroaching sands surmounted the plateau, the upper surface of the headland was exposed to the full action of eolian abrasion. Drainage lines were thus demolished and surface irregularities obliterated, hence the present blunt appearance of the Sohag Surface.

The highest values of drainage density and stream frequency obtain wherever rejuvenated streams have cut their courses in the Libyan hard crust and thereby incised their channels in the softer underlying formations. Two phases of this Rejuvenated Surface appear in the maturely dissected basin of Wadi Abu Retag, and the less dissected surface of the headland west of Abydos (Fig. 2 and table 1, D). Being on the upthrown side of a major fault, the rejuvenated Wadi Abu Retag and its tributaries stripped the old surface completely from their basin and reduced its level by some 30 meters below the general level of the Libyan Surface. Another phase of stream rejuvenation appears at the Abydos headland which was uplifted along a number of subparallel faults, but here parts of the hard Libyan Surface still cover the broad interfluves, especially in the upper reaches of the drainage basins. Furthermore, Wadi Samhud basin immediately south of the headland was rejuvenated following diversion to a lower base level toward the Nile as stated before.

Medium-textured topography dominates a narrow belt extending between the Libyan Surface and the edge of the limestone plateau west of Girga Embayment (Fig. 2 and table 1, E & F). Streams draining this belt, here termed the Aqaba Surface, have reached in their headward erosion the edge of the Libyan Surface, but obviously their work was hampered by the advent of present dry conditions. A few kilometers upstream from the main scarp, water courses decrease rapidly in number and size until the action of sheetfloods sweeping over broad tracts of the relatively flat terrain overshadows that of streamfloods eroding along definite lines. In this respect, it seems that absence of well marked drainage lines characterizing the Libyan Surface in the area under consideration, along with its greater extension in the vast expanses of the

Western Desert of Egypt, is chiefly owing to lack of slope rather than scarcity of rainfall as has usually been reasoned. Well-developed drainage lines are found in various parts of the Western Desert wherever steep slopes obtain, such as those dissecting the rugged margin of Oweinat-Gilf el-Kebir highland [1], and the more impressive channel system descending the eastern margin of this desert along the Nile Valley from Giza to the southern borders. In the meantime, surface runoff on the broad stony plains of the interior forms sheetfloods that spread over the surface before they eventually end to numerous internal depressions where they are lost through seepage and evaporation.

In view of this evidence, and assuming a Miocene age for the Nile and its major wadis [2], it seems that the interior parts of the Western Desert were deprived of true river systems not only during Quaternary [3], but also during the late part of the Tertiary. There were periods of heavy rainfall and intensive sheetfloods, throughout, but their effect was to promote the flatness of the existing terrain.

THE EMBAYMENTS :

Dendritic and braided patterns, developed on horizontal Pliocene sediments, dominate the desert surface within the embayments (Fig. 2, G and H). The dendritic pattern occupies the area between the limestone plateau and the tufa scarp, whereas the braided pattern appears in the lower reaches of the Girga Embayment. In the absence of obvious structural controls, it seems that the erratic irregularity of the initial depositional surface is practically the only control, hence a majority of the water courses may be classified as insequent wadis. However, the location of a number of the main courses has been determined by the spots at which older wadis issue from the limestone plateau, but in many cases, such wadis have been re-oriented according to the initial slope of the embayment floors. This feature is particularly well pronounced in the Girga

(1) John BALL, *Contributions to the Geography of Egypt,* Cairo, Government Press, 1939, p. 10.

(2) SANDFORD (1939), *op. cit.,* p. 499 and 541.

(3) M. MITWALLY, «Physiographic Features of the Libyan Desert», *Bulletin de l'Institut du Désert d'Egypte,* vol. 3, no. 1, 1953, p. 150.

Embayment where a number of southeast tributaries upon leaving the limestone country bend sharply to the east following the general slope of the land.

It is interesting to note that the youthful, narrow gorges with their cascading badrock floors and bold bluffs in the limestone plateau give way, as soon as they enter the flat surface of the embayments, to open sandy washes, separated from one another by broad interfluves a few meters high. The texture of topography (Fig. 2 and table 1, G and H) is rather coarse as the greater majority of the water courses are poorly-defined, shifting channels serving as mere distributaries for the upper canyons. This drastic change in valley forms while reflecting a marked lithological difference and the effect of abrupt break in stream gradients, is above all, the result of difference in age between gorges cut in the plateau as early as Miocene times and incipient washes initiated on the Pliocene fill in early Pleistocene and Recent times.

Initiation of the drainage system in the embayments announced the beginning of a prolonged phase of degradation which has prevailed throughout the Quaternary. In consequence, the Pliocene surface was reduced by lateral planation to an erosional plain assuming two distinct levels : a lower level extending between the floodplain of the Nile and the travertine escarpment, and an upper level, from 25 to 45 meters above the former, covering the area from the travertine escarpment to the base of the limestone plateau. Difference in altitude is owing to the presence of the resistant travertine barrier, which as it obstructed wadi courses gave rise to pronounced neckpoints midway between the plateau and the edge of cultivation. Upstream from this barrier, stream downcutting was impeded, hence the survival of a greater mass of Pliocene sediments within the upper part of the embayments. Meanwhile, continued truncation downstream from the barrier caused rapid removal of the soft marl and the formation of the lower level of the plain toward the Nile. Erosion remnants marking the former level of the old aggradational surface stand out in a number of small outliers opposite Beit-Khallaf, Nawahid, and Karnak. In a few instances however, powerful wadis have been able to breach the barrier at the center of the Girga Embayment and extended the lower surface athwart, right to the limestone foothills.

Absence of the travertine deposits from the southern part of the Samhud Embayment had the same effect. The lower level of the plain here, was extended across the embayment by the broad course of Wadi el-Karnak which continued degradation as it avoided the southern edge of the travertine scarp. Within an area of about eight square kilometers of the wadi bed due south of Kolet el-Kataya, spreads of sizable limestone boulders have been uncovered by erosion, and remained as the last identification of the extensive old fill that once contained them. As some boulders are being currently exhumed, degradation is continuing.

While lateral planation has dominated the embayment floors during Quaternary, the entrenched course of lower Wadi Samhud was the only exception. Following the diversion of the interior basin to the east, as stated earlier, sudden increase of discharge in the pirate stream stimulated channel downcutting through the elevated Pliocene surface, and the channel was incised from 15 to 25 meters in the fill. Subsequent lateral displacement offset the lower course of the wadi at a point about seven kilometers away from the limestone scarp, causing partial diversion of its drainage to a new channel in the south. A triangular mesa of Pliocene sediments southwest of Nawahid split the drainage, but since the old channel had a steeper gradient owing to a lower base level, it continued to receive the larger share of the flow. The new course, followed by the Oasis Railroad, has been abandoned.

The prevalence of degradation over deposition in post-Pliocene times is further indicated by a number of significant features. In the first place, sizable alluvial fans or deltas are seriously lacking where they were expected to develop in the zone of sudden decrease in stream gradients at the base of the bordering scarp. Talus cones and detrital slopes are almost negligible, and slipped blocks so frequent elsewhere along the Nile Valley sides are rare. All in all, the combined action of Quaternary alluviation and colluviation as manifested in the present landscape is modest. Chief contributions of that period are red sand beds covering older sediments, and local gravels laid down by wadis toward the lower reaches of the embayments. A recent series of about seven meters of alternating fine gravel beds and loose sands overlying old Nile Silts (Sebilian) at the ground water level, were recorded from numerous holes sunk by natives in wash beds to irrigate marginal lands at the edge of the desert. These post upper Paleolithic sediments illustrate the interplay between fluvial deposits represented by Nilotic sands and local gravels transported from the desert by torrential runoff announcing the advent of present drought.

Furthermore, spreads of superficial quartz pebbles are found in small patches in a wash bottom northeast of Kolet el-Kataya and on hill sides west of Awlad Salama. Some of these spreads were noted by Sandford who thought that they may be compared with similar spreads at Ballas and Dendera to which he assigned Pliocene age [1]. But while the dark patina acquired by these pebbles may indicate their antiquity, it seems that they are actually recent reworked material resulting from the disintegration of Pliocene conglomerate beds containing abundant quartz pebbles in their immediate vicinity.

An intricate braided pattern of shifting distributaries characterizes the lower part of Girga Embayment. Numerous islets of slightly higher land occur among the washes as the channels bifurcate and reconnect at varying intervals. The upper surfaces of such islets constitute patches of desert pavement at different stages of development, and where mature, they are peculiarly smooth with gravels and lag pebbles compacted into hard crusts. The dark appearance of these surfaces suggests that gravels and pebbles forming the crusts have apparently remained in their positions long enough to acquire a tan brown or even black desert varnish. Colors are usually accentuated by the polishing action of the natural sand blast which may cause the whole surface to glisten in the sun.

Finally, it should be noted that while repeated channel cutting and filling favoured the development of a typical braided pattern in the lower part of Girga Embayment, slight uplift at the lower edge of Samhud Embayment resulted in extermination of secondary channels and the abolishment of the old braided pattern. South of Abydos, major trunks only survived as antecedent wadis which confined the flow between high levees and impeded the split of channels. Gorges from seven to ten meters deep cut by these wadis in late Pleistocene fanglomerate during

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[1] SANDFORD (1929), *op. cit.*, pp. 503-504.

Recent times demonstrate the efficiency of desert wadis as agent of land sculpture. This example shows that the widely-accepted view denying the effectiveness of present intermittent streams in modeling desert landscape is not justifiable.

EOLIAN FORMS

Erosion :

The present blunt appearance of the subdued Sohag Surface is attributed to wind erosion as it occurs on a prominent headland protruding in the pass of unremitting northwestern winds funneling all year round through the Nile Valley. Great amounts of blown sand are being constantly transported across the upper headland surface through a number of drainage lines which parallel the direction of prevailing winds. Therefore, the effect of severe sand abrasion is everywhere manifested by fluted bedrock surfaces in yardang-like forms, and by the undercut bases and the polished sides of buttes scattered throughout the surface. The orientation of buttes, which are usually elongated in the direction of prevalent winds, suggests that they have been carved out from a larger limestone mass by the action of wind erosion. Nevertheless, water dissection had apparently removed the greater part of the Libyan hard crust that formerly capped the Sohag Surface, and thereby facilitated the action of eolian abrasion in obliterating surface features sculptured in softer formations.

With the exception of features described above, only minor forms are attributed to the action of the natural sand blast in the vicinity of sand-covered surfaces. Among these forms, pitted and throughly bored limestone boulders and cobbles are most common (Plate II, B). In places, the windward slopes of hills are covered with so well-worn limestone gravels that the different stages of ventifact development occur side by side at any locality. But while furrows and facets in limestone boulders and gravels testify the power of sand abrasion, flint cobbles and quartz pebbles, owing to their supreme resistance, are only polished and their original sharp edges are rendered slightly blunt.

Deposition :

Erosional forms discussed above, are of minor significance in the landform expression when compared with the pronounced features of eolian deposition scattered throughout the area. Topography is the chief factor accounting for sand accumulation as both limestone cliffs and jutting hills intercept sand-laden winds and force them to drop their burdens. Eight sand samples representing a variety of sand forms were analyzed. The result of mechanical analysis given in table 2, shows that eolian sands in the area are on the whole well sorted as sorting coefficient values range between 1.54 and 1.08. Median diameters of the grains fall between 0.36 and 0.18 mm. with an average of 0.28 mm.

TABLE 2

Statistical Results of Mechanical Analysis of Sand Samples

SAMPLE NUMBER AND ENVIRONMENT	MDmm	Q3mm	Q1mm	SO	SK
1. Lee of sand Shadow west of Beit Khallaf	0.36	0.45	0.26	1.29	0.92
2. Base of Slip surface of barchan.	0.25	0.36	0.19	1.37	1.23
3. Barchan crest	0.18	0.19	0.16	1.08	0.93
4. Base of windward side of sand shadow west of Nag el-Ghawanim	0.28	0.50	0.21	1.54	1.35
5. Crest of Sand drift at entrance to Wadi Abu Retag	0.20	0.26	0.15	1.31	0.97
6. Sand bed 3 meters below surface west of el-Nawahid	0.23	0.31	0.17	1.35	0.99
7. Fluvial, subsurface bed west of el-Nawahid	0.20	0.28	0.16	1.32	1.22
8. Sand embankment north of Dir Amba Shenouda	0.18	0.19	0.12	1.26	0.70
MEAN.....................	0.23			1.31	1.04

In this respect, sand deposits here are comparable with dune sands from Gebel Asfar northeast of Cairo [1], and other eolian deposits in the Coachella Valley of southern California [2]. In terms of texture and sorting, eolian sands in the area differ slightly from fluvial sands (Table 2, sample 6

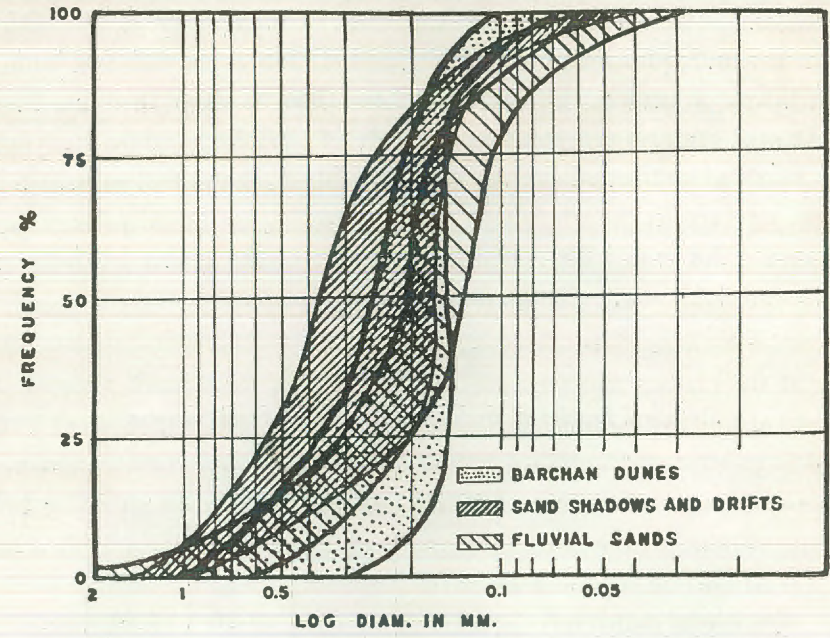


FIGURE (3) CUMULATIVE CURVES OF SAND SAMPLES.

and 7) of which they are mostly derived (Fig. 3). A majority of the samples show negative skewness indicating that the finer admixture exceeds the coarser fraction. However samples taken from the bases of accumulations show the opposite.

Major sand forms in the area include sand shadows and drifts [3] ranging in dimension from thin veneers on the northern hill slopes within the

(1) G. Philip and S. Beheiri, « Mechanical Analysis and Mineral Composition of Gebel el-Asfar Dunes», *Bulletin of the Faculty of Science,* Cairo University No. 37, 1961, p. 78.

(2) Salah A. Beheiry, « Sand Forms in the Coachella Valley, Southern California», *Annals of the Association of American Geographers,* March, 1967, pp. 25-49.

(3) R. A. Bagnold, *The Physics of Blown Sand and Desert Dunes,* London, 1941, pp. 189-193.

lower parts of the embayments, to enormous sand embankments overwhelming the high limestone cliff west of Sohag (Plate II, A). The physical characteristics of sand bodies such as thickness of accumulations, mobility of particles, and grain size, are determined by topographic elements including the shape of slope and the height and orientation of obstacles. Therefore, thin windward shadows of coarse sands at the bases of covex slopes (Table 2, sample 1 and 4) are replaced by thick veneers of finer sand within concave slopes and valley troughs ascending the plateau (Plate III, A). The best development of sand shadows are found on the north-facing cliffs of the headlands which trap oncoming sands and force them to settle. On the other hand, sand shadows are completely absent on the surface of the south-facing cliffs, instead, sand drifts may abound.

Sand drifts are associated with gaps fashioned by drainage channels in the edge of the plateau where converging wind currents transport concentrated streams of sand to deposit it in the lee of cliffs (Plate III, B). The size of such drifts is greatest where drainage lines parallel the direction of sand-bearing winds and descend the plateau at right angles to the cliffs. A good example is demonstrated by the south-facing scarp of the Sohag headland due west of Awlad Gharib. In this area an intensive drift accumulated below the gap of a major wadi, thus furnishing a sand source for a number of brachan dunes located within a short distance down-wind from the scarp. Drift sands are usually finer and better sorted (sample 5) than those comprising sand shadows. Furthermore, drift sands are more susceptible to movement as sand grains slide or creep downhill, whereas sand grains in windward shadows tend to settle by accrition or lag at bluff bases allowing only the finer admixture to move uphill.

Within the limestone plateau, small, but well-developed barrier drifts accumulate in the west-east segments of master valleys that receive tributaries from the north. In the shelter of spurs separating the confluences of every pair of such tributaries, sands funneling through tributary cuts come to rest in the relatively stagnant air at the base of spurs. These drifts continue to grow from the northern sides of the valleys until they reach the opposite sides and form wall to wall bars choking master channels completely at varying intervals. The largest barrier

drift in the area is 20 meters high, 80 meters wide at the base, and 200 meters long across the broad re-entrant of Wadi Abu Retag as it issues from the limestone plateau. The sides of the drift are inclined at the angle of repose of sand, hence, its knife-edged crest consisting of well sorted fine sand (Table 1, sample 5).

A belt of ten well-developed barchan dunes is found in the northern part of Girga Embayment at a distance of about three kilometers west of the edge of cultivation. The dunes are located on a northwestern axis aligned with a major valley through which a constant supply of fine sand is being transported across the Sohag Surface to the sand drift west of Awlad Gharib. The theoritical stages of barchan dune formation from sand drifts as outlined by Bagnold [1] apply to the course of barchan development in this area. Within a short distance from the cliff base, the surface of the drift bulges in a number of sand mounds which, as they increase in size downwind represent the emberyonic stages of crescentic dunes. Toward the outer edge of the drift, three of these mounds have already reached the stage of independant barchans. Another group of three equally spaced barchans move on the naturally-paved gravel surface of the upper plain due west of Kawamil.

Further south, four larger barchan dunes are found on the lower plain level not far from the travertine scarp. The largest barchan of this group (second from the north) is 200 meters wide between the wings, 230 meters long from tail to crest, and 40 meters high. The exceptional height of this dune [2] is attributed to a complicated course of development as testified by its terraced lee surface. It seems that for some reason the dune has been disturbed, and that the central part of its original crest has collapsed forming a gap where fast deflation took place. Consequently, the lee surface in the gap site advanced faster than elsewhere, and in time, a new lee surface was constructed a short distance in front of the original surface of the dune. As the new lee surface grew, its crest imposed an obstacle in the path of wind currents funneling through the gap

[1] *Ibid.*, p. 194-195.

[2] Bagnold believes from his wide experience, that the maximum height of barchan dunes is 30 meters (See BAGNOLD, p. 214).

forcing them to deposit much of their sand burden between the new crest and the gap. The gap was eventually bridged and the old lee surface was thus restored. As both the old and the new surfaces continued their normal growth, the dune retained its present terraced lee surface.

The tail dune in the barchan belt is a small barchan about 90 meters wide, 120 meters long, and 20 meters high. Sand samples taken from this dune are the finest and best sorted in the eolian category (Table 2, sample 2 and 3).

A small chain of longitudinal dunes occurs in the valley of a tributary joining the main wash of Wadi Abu Retag immediately below the edge of the plateau. The entrance of this tributary is blocked by a sand drift which occupies the whole wadi trough, and extends upstream to the top of the plateau. A short distance up valley from the wadi embouchure, the crest of the drift swells at regular intervals to form a chain of summits that continue for a distance of three kilometers on the upper surface of the plateau. The slow movement of the chain up valley is facilitated by topography as it follows the comparatively gentle slope of the wadi bed which coincides with the direction of constant winds. However, the rate of advance is meagre as indicated by the modest length of the chain. Obviously the general onward march of the dunes down-wind is partly defeated by the difficulty of advance uphill.

The summits of the longitudinal dune chain resemble the barchan form in that the lee surfaces are oriented down-wind, and the crests run mainly transverse to the direction of northwestern wind. This form suggests that the chain originated from a barchan belt, which owing to slow ascent, the composing barchans have overtaken one another, and as they were finally closely packed, the original barchan form was modified to approach the successive summit chain typical of longitudinal dunes.

LAND USE

Apart from gravel and marl pits worked along the lower edge of the desert, and limestone quarries in Gebel Abu el-Nur and the headland west of Sohag, the desert has remained a desolate useless waste over the ages. Even the Pliocene marl which contains traces of sodium nitrate,

and which for sometime was being used as a natural fertilizer, is no longer in use after the introduction of chemical fertilizers in Egypt at the beginning of the present century. This has saved laborious land tillers the ordeal of digging the marl out, and transporting it on camel back several kilometers from the desert to their fields where a camel could deliver only two loads per day. But during the years of World War II when imports from chemical fertilizers stopped, the peasants opened the old pits again and continued to manure their fields the hard way till the end of the war. Years of use have left their impact on the desert surface as pits and tailings have rendered vast areas inhospitable for motor vehicles.

The major uses of the desert fringe have been in settlement and agriculture. A string of small rural communities that may agglomerate in hamlets and modest villages extends along the edge of the desert. A dirt road locally known as el-Hajir, connects these settlements and forms a sharp boundary between raw desert and cultivated land. A peculiar feature along the road side is the presence of a great number of cemeteries used by both the marginal settlements and other communities located far within the cultivated belt. The desert margin consisting of high and dry ground is preferred for such use as it is elevated above flood water deliberately inundating bottom lands for a period of 40 to 60 days every year in conjunction with the traditional system of basin agriculture. Moreover, this wise use of desert land saves quite a few acres of valuable good land for agriculture production, which would otherwise pass into non-productive use.

Concerning agriculture, it is regretful to state that the patient endeavours of the land-hungry people to expand their fields at the expense of the raw desert have been usually vanquished. In the first place, Pleistocene gravels, though occupying an extremely narrow belt fringing the modern flood-plain, yet they limit the ambitions of many tillers. The gravels contain no soil, and wherever poor stony soils exist, they are being tilled at a great expense. Irrigation water is lifted from deep water bores by such outmoded devices as the shadouf or the water wheel, but unfortunately, coarse soil texture permits rapid infiltration which increases water demands considerably. Sand encroachment over fields and open irrigation wells, plus constant menace from unpredicted torrential floods, cause many peasants to abandon their marginal fields.

Desert agriculture has, however, succeeded in a limited, oasis-like district encompassing several hundred acres in the area between Karnak and Nawahid. This agricultural district is part of the low desert plain of Samhud Embayment located at a level from 15 to 20 meters above the surface of neighbouring parts of the Nile flood plain. The soil here is highly productive since it consists chiefly of Pliocene marl with a smaller admixture of fine sand free from stones and gravels. Expansion seems to have started more than 30 years ago from a gap in the Pleistocene gravel fringe immediately north of Karnak. An ample water source is secured from deep wells tapped by mechanical units. Now the per acre yields of vegetables, wheat and barley from this virgin land exceed those obtained from Nile lands.

Obviously, the Pleistocene surface has imposed a physical handicap that deterred expansion, and restricted occupance to the limited realm of the recent Nile mud. Man has been aware of the fertile soil lying behind the Pleistocene «fence», and since he could not move there permanently, he moved whatever he could from this soil to his fields.

Several thousand acres of the low desert plain in both embayments are underlain by highly productive marls, but removal of superficial alluvium, and leveling of surface irregularities should precede reclamation. Water may be available from the potable underground reservoir, or from irrigation canals bringing Nile water to the desert edge where it may be lifted up as desired. Certain protective measures such as wind breaks and torrent drains are necessary to avoid the natural hazards of sifting sands and sporadic wadi floods.

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A. — Travertine-capped butte.



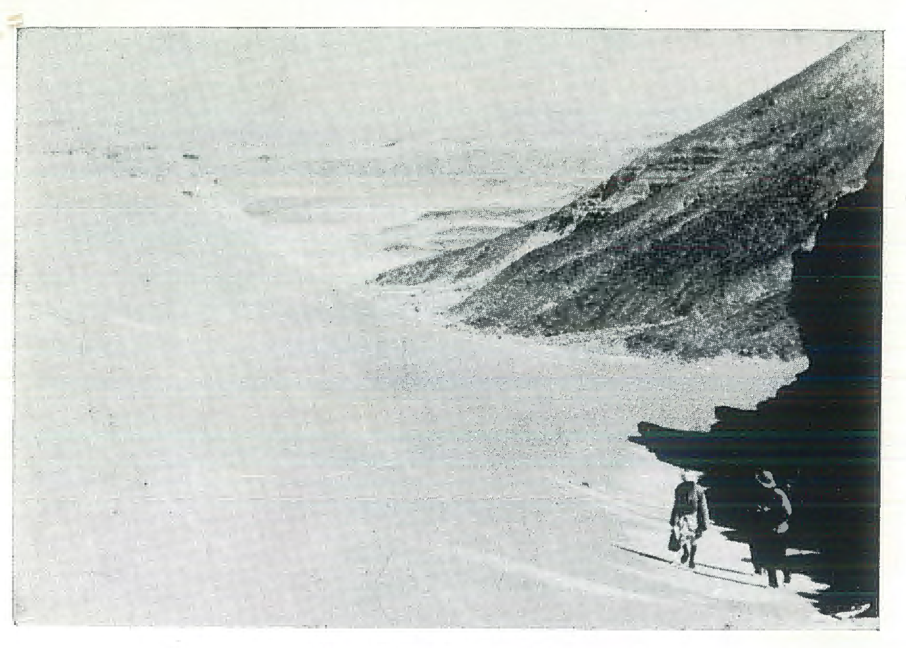
B. — Pleistocene gravels and Nile sand beds at Nawahid.



A. — Eolian sands engulfing the limestone escarpment west of Sohag.



B. — Sand-blasted limestone boulder.



A. — Sand shadow at wadi entrance.



B. — Lee drift behind a butte.

II. LA STRUCTURE CÉPHALIQUE DES POPULATIONS DU FAYOUM ET DE L'OASIS DE BÉHEIRA

PAR

ROBERT-P. CHARLES

AVANT-PROPOS

Utilisant les mensurations faites lors de la Première Expédition Anthropologique Egypto-Polonaise, nous avons publié dans un précédent tome de ce *Bulletin,* une première contribution à l'Anthropologie de l'Egypte moderne [1] dans laquelle nous avons exposé les principes d'une méthode nouvelle pour l'étude des populations modernes, issue de l'application des principes de Falkenburger, que cet auteur, récemment disparu, et nous-même avions mis en évidence d'après des études sur les squelettes. Ces recherches devaient aboutir à une nouvelle systématique des types humains, dont nous avons récemment pu donner un exposé général [2].

La publication des mensurations faites au cours de la Seconde Expédition Egypto-Polonaise, nous permet de poursuivre notre enquête

[1] Robert-P. Charles. Considérations sur la structure céphalique des populations du district occidental d'Egypte. *Bull. Soc. de Géogr. d'Egypte,* t. XXXV, 1962, pp. 13-75.

[2] Robert-P. Charles. L'Anthropologie archéologique : buts, méthodes, premiers résultats. *Annales,* 21° ann., n° 3, Paris 1966, pp. 518-552, 8 fig. ou cartes.

suivant les principes déjà exposés [1]. Nous ne reviendrons pas sur la méthode, le lecteur étant prié de se reporter à notre première contribution [2] ; nous ne donnerons ici que les précisions statistiques apportées par l'étude de ce nouveau matériel.

ÉTUDE SYSTÉMATIQUE DES GROUPES

Groupe ABC : Paléo-kamitique

Distribution des sujets. Nous avons classé dans ce groupe, 71 sujets masculins se répartissant comme suit :

Fayoum. Autochtones, adultes :

Dolichocéphales, 11 sujets : n° 1, 2, 3, 7, 8, 11, 12, 29, 35, 40, 44 ;
Mésocéphales, 6 sujets : n° 9, 17, 18, 36, 38, 46.

Autochtone, adolescent :

Dolichocéphale, 1 sujet, n° 57.

Autochtones, garçons :

Dolichocéphales, 4 sujets : n° 66, 70, 71, 74.

Non-autochtones, adultes :

Dolichocéphales, 2 sujets : n° 182, 184.

Non-autochtones, garçons :

Dolichocéphale, 1 sujet, n° 194 ;
Mésocéphale, 1 sujet, n° 219.

Sennouris. Autochtones, adultes :

Dolichocéphales, 4 sujets : n° 424, 441, 446, 451 ;
Mésocéphales, 2 sujets : n° 418, 420.

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[1] *Publications of the Second Arabic-Polish Anthropological Expedition 1962.* Part III, Anthropological Measurements of Population in the United Arab Republic (Egypt-Fayoum, Beheira). Varsovie-Poznan-Cairo 1965.
[2] Robert-P. Charles, *op. cit.*, 1962, spécialement pp. 14-52.

Kuta. Autochtones, adultes :

Dolichocéphales, 11 sujets : n° 874, 879, 880, 895, 897, 898, 902, 908, 921, 932, 962 ;
Mésocéphale, 1 sujet, n° 909.

Non-autochtones, adultes :

Dolichocéphales, 5 sujets : n° 987, 988, 991, 994, 996.

Beheira. Autochtones, adultes :

Dolichocéphales, 9 sujets : n° 833, 836, 841, 842, 845, 846, 7, 16, 22 ;
Mésocéphales, 2 sujets : n° 843, 27.

Autochtone, adolescent :

Mésocéphale, 1 sujet, n° 29.

Non-autochtones, adultes :

Dolichocéphales, 4 sujets : n° 861, 862, 40, 42 ;
Mésocéphales, 5 sujets : n° 869, 38, 43, 49, 54.

Appartiennent également au groupe ABC, 16 sujets féminins :

Fayoum. Autochtones, adultes :

Dolichocéphale, 1 sujet, n° 288 ;
Mésocéphales, 2 sujets : n° 247, 249.

Autochtone, adolescente :

Mésocéphale, 1 sujet, n° 288.

Autochtone, fille :

Dolichocéphale, 1 sujet, n° 319.

Non-autochtone, adolescente :

Dolichocéphale, 1 sujet, n° 370.

Sennouris. Autochtones, adultes :

Dolichocéphale, 1 sujet, n° 506 ;
Mésocéphale, 1 sujet, n° 502.

SHAK-SHUK. Autochtone, adulte :

Dolichocéphale, 1 sujet, n° 735.

Autochtone, fille :

Dolichocéphale, 1 sujet, n° 780.

KUTA. Autochtones, adultes :

Dolichocéphales, 2 sujets : n° 1029, 1038.

BEHEIRA. Autochtone, adulte :

Mésocéphale, 1 sujet, n° 71.

Autochtone, adolescente :

Dolichocéphale, 1 sujet, n° 114.

Autochtone, fille :

Dolichocéphale, 1 sujet, n° 156.

Non-autochtone, adolescente :

Dolichocéphale, 1 sujet, n° 197.

CARACTÈRES INDEXABLES. L'étude statistique nous a permis d'établir les caractères anthropométriques moyens du groupe paléo-kamitique, conformément au tableau suivant :

Indices (groupe ABC)	sujets masc. n = 71		sujets fém. n = 16		Caractéristiques
	m	σ	m	σ	
céphalo-facial transversal ...	95	3	92	2,4	méso à hypermacropside.
— — physionomique	86,9	2,9	83,5	2,5	métrio à hypsiprosope.
— — structural	56,2	2,3	56	2	hypsiène (par déf.).
facial total	90	4	90,5	3,5	leptoprosope.
— supérieur...........	58	2,7	61	2,3	leptène.
nasal....................	62,4	3,8	60,5	4,9	leptorhinien.

Si l'on compare ces résultats à ceux que nous avions obtenus pour les sujets du même groupe structural, étudiés dans le district occidental [1], on constate que ces derniers ont, d'une manière générale, le visage plus étroit — et aussi le nez plus fin — que les sujets du Fayoum et de Beheira. En revanche, les différences métriques d'un sexe à l'autre, sont du même ordre dans l'un et l'autre districts.

Nous considérons comme particulièrement caractéristiques du groupe ABC le sujet masculin n° 36 de Fayoum [2] ainsi que le sujet féminin n° 506 de Sennouris.

Groupe AC : Sub-méditerranéen

DISTRIBUTION DES SUJETS :

1. *Sous-groupe africain.*

Nous avons classé dans ce sous-groupe, 45 sujets masculins se répartissant comme suit :

FAYOUM. Autochtones, adultes :

Kamitiques, 2 sujets : n° 5, 25 ;
Libyco-berbère, 1 sujet, n° 32 ;
Berbéro-tellien, 1 sujet, n° 27.

Autochtones, garçons :

Kamitique, 1 sujet, n° 76 ;
Libyco-berbères, 3 sujets : n° 78, 105, 106.

Non-autochtone, adulte :

Libyco-berbère, 1 sujet, n° 186.

Non-autochtone, adolescent :

Libyco-berbère, 1 sujet, n° 192.

[1] Robert-P. CHARLES, *op. cit.*, 1962, p. 25.
[2] Cf. aussi les sujets n° 2 (fig. 118) et 3 (fig. 137).

Non-autochtones, garçons :

Libyco-berbères, 2 sujets : n° 200, 204.

Sennouris. Autochtones, adultes :

Kamitiques, 4 sujets : n° 437, 443, 448, 470;
Libyco-berbères, 2 sujets : n° 425, 430.

Autochtone, adolescent :

Libyco-berbère, 1 sujet : n° 476.

Kuta. Autochtones, adultes :

Kamitiques, 6 sujets : n° 881, 893, 924, 936, 937, 950.

Non-autochtones, adultes :

Kamitiques, 2 sujets : n° 983, 1015.

Beheira. Autochtones, adultes :

Kamitiques, 2 sujets : n° 838, 839;
Libyco-berbères, 8 sujets : n° 832, 1, 2, 8, 10, 13, 18, 21;
Berbéro-tellien, 1 sujet, n° 830.

Non-autochtones, adultes :

Kamitiques, 3 sujets : n° 864, 868, 39;
Libyco-berbères, 3 sujets : n° 866, 36, 55;
Berbéro-tellien, 1 sujet, n° 45.

Appartiennent également au sous-groupe africain du groupe AC, 37 sujets féminins :

Fayoum. Autochtone, adulte :

Kamitique, 1 sujet, n° 257.

Autochtones, adolescentes :

Libyco-berbères, 2 sujets : n° 274, 286;
Berbéro-telliens, 2 sujets : n° 265, 279.

Autochtones, filles :

Libyco-berbères, 4 sujets : n° 313, 334, 352, 357.

Non-autochtones, filles.

Libyco-berbères, 4 sujets : n° 373, 386, 416, 417;
Berbéro-telliens, 2 sujets : n° 379, 395.

Sennouris. Autochtones, adultes :

Kamitique, 1 sujet, n° 504;
Libyco-berbère, 1 sujet, n° 507.

Autochtones, filles :

Kamitique, 1 sujet, n° 562;
Libyco-berbères, 3 sujets : n° 516, 528, 599.

Shak-Shuk. Autochtones, adultes :

Libyco-berbères, 2 sujets : n° 736, 756.

Autochtone, adolescente :

Berbéro-tellien, 1 sujet, n° 772.

Kuta. Autochtone, adulte :

Kamitique, 1 sujet, n° 1034.

Beheira. Autochtones, adultes :

Kamitiques, 2 sujets : n° 66, 67;
Libyco-berbères, 2 sujets : n° 84, 88.

Autochtones, adolescentes :

Kamitique, 1 sujet : n° 104;
Libyco-berbères, 5 sujets : n° 121, 136, 137, 140, 144.

Autochtones, filles :

Libyco-berbères, 2 sujets : n° 153, 162.

2. *Sous-groupe asiatique.*

Nous avons classé dans ce sous-groupe, 54 sujets masculins se répartissant comme suit :

FAYOUM. Autochtones, adultes :

Sud-orientaux, 2 sujets : n° 10, 53 ;
Syro-cananéens, 2 sujets : n° 16, 24.

Autochtones, garçons :

Sud-orientaux, 8 sujets : n° 73, 82, 93, 94, 114, 115, 135, 146 ;
Syro-cananéens, 7 sujets : n° 83, 86, 103, 107, 108, 127, 144 ;
Syro-arménoïde, 1 sujet, n° 140.

Non-autochtone, adolescent :

Sud-oriental, 1 sujet, n° 191.

Non-autochtones, garçons :

Sud-orientaux, 2 sujets : n° 198, 213.

SENNOURIS. Autochtones, adultes :

Sud-orientaux, 2 sujets : n° 465, 473 ;
Syro-cananéens, 2 sujets : n° 445, 471.

Autochtone, adolescent :

Syro-cananéen, 1 sujet, n° 476.

Autochtone, garçon :

Syro-cananéen, 1 sujet, n° 478.

KUTA. Autochtones, adultes :

Sud-orientaux, 6 sujets : n° 878, 892, 919, 935, 951, 956 ;
Syro-cananéens, 2 sujets : n° 913, 963.

Autochtone, adolescent :

Sud-oriental, 1 sujet, n° 970.

Autochtones, garçons :

Sud-oriental, 1 sujet, n° 976 ;
Syro-cananéen, 1 sujet, n° 979.

Non-autochtones, adultes :

Sud-orientaux, 3 sujets : n° 995, 1010, 1021.

BEHEIRA. Autochtones, adultes :

Sud-orientaux, 4 sujets : n° 837, 849, 851, 25 ;
Syro-cananéens, 4 sujets : n° 840, 857, 14, 17.

Non-autochtones, adultes :

Sud-oriental, 1 sujet, n° 46 ;
Syro-cananéen, 1 sujet, n° 47.

Non-autochtone, adolescent :

Sud-oriental, 1 sujet, n° 56.

Appartiennent également au sous-groupe asiatique du groupe AC, 118 sujets féminins.

FAYOUM. Autochtones, adultes :

Sud-oriental, 1 sujet, n° 251 ;
Syro-cananéens, 2 sujets : n° 243, 258.

Autochtones, adolescentes :

Sud-orientaux, 5 sujets : n° 267, 276, 289, 298, 300 ;
Syro-cananéens, 2 sujets : n° 280, 290.

Autochtones, filles :

Sud-orientaux, 2 sujets : n° 308, 353 ;
Syro-cananéens, 6 sujets : n° 305, 314, 321, 336, 347, 355.

Non-autochtones, filles :

Sud-orientaux, 3 sujets : n° 376, 383, 413;
Syro-cananéens, 5 sujets : n° 378, 382, 388, 400, 401;
Syro-arménoïde, 1 sujet, n° 396.

SENNOURIS. Autochtone, adulte :

Sud-oriental, 1 sujet, n° 503.

Autochtones, filles :

Sud-orientaux, 13 sujets : n° 510, 513, 517, 520, 526, 540, 541, 544, 548, 553, 560, 561, 566;
Syro-cananéens, 6 sujets : 519, 525, 539, 543, 550, 551;
Syro-arménoïde, 1 sujet, n° 567.

Non-autochtones, filles :

Sud-orientaux, 3 sujets : n° 607, 611, 615;
Syro-cananéens, 3 sujets : n° 603, 606, 609.

SHAK-SHUK. Autochtones, adultes :

Sud-orientaux, 5 sujets : n° 734, 740, 743, 759, 763;
Syro-cananéens, 7 sujets : n° 742, 745, 746, 747, 749, 758, 767.

Autochtones, adolescentes :

Sud-orientaux, 2 sujets, n° 770, 771;
Syro-cananéen, 1 sujet, n° 774.

Non-autochtone, adulte :

Sud-oriental, 1 sujet, n° 817.

KUTA. Autochtones, adultes :

Sud-orientaux, 8 sujets : n° 1027, 1030, 1033, 1035, 1040, 1044, 1048, 1054;
Syro-cananéens, 2 sujets : n° 1032, 1039.

BEHEIRA. Autochtones, adultes :

Sud-orientaux, 7 sujets : n° 58, 61, 65, 75, 77, 78, 85;
Syro-cananéens, 2 sujets : n° 72, 79.

Autochtones, adolescentes :

Sud-orientaux, 6 sujets : n° 94, 117, 131, 132, 135, 150;
Syro-cananéens, 8 sujets : n° 95, 105, 106, 116, 119, 122, 130, 133;
Syro-arménoïde, 1 sujet, n° 138.

Autochtones, filles :

Sud-orientaux, 5 sujets : n° 152, 163, 171, 178, 179;
Syro-cananéens, 3 sujets : n° 151, 165, 170.

Non-autochtone, adulte :

Syro-cananéen, 1 sujet, n° 185.

Non-autochtones, adolescentes :

Sud-orientaux, 2 sujets : n° 190, 198;
Syro-cananéen, 1 sujet, n° 196.

Non-autochtones, filles :

Sud-oriental, 1 sujet, n° 209;
Syro-cananéen, 1 sujet, n° 204.

CARACTÈRES INDEXABLES. L'étude statistique nous a permis d'établir les caractères anthropométriques moyens du groupe sub-méditerranéen conformément au tableau suivant :

Indices (groupe AC)	sujets masc. n = 99		sujets fém. n = 155		Caractéristiques
	m	σ	m	σ	
céphalo-facial transversal ...	92,4	3,9	90,5	3,5	mésopside.
— — physionomique	81,6	3,9	76,8	3,4	chamæ à métrioprosope.
— — structural	52,5	1,2	51,2	1,4	métriène (par déf.).
facial total	86	3,7	87,3	4,1	mésoprosope.
— supérieur	54,4	2,9	56,5	2,3	mésène.
nasal....................	66,6	3,2	63,7	6,2	leptorhinien (par déf.).

Si l'on compare ces résultats à ceux que nous avions obtenus pour les sujets du même groupe structural étudiés dans le district occidental [1], on constate que ces derniers ont, d'une manière générale, le visage plus étroit — et aussi le nez plus fin — que les sujets du Fayoum et de Beheira. En revanche, les différences métriques d'un sexe à l'autre sont du même ordre dans l'un et l'autre districts.

Nous considérons comme particulièrement caractéristiques du groupe AC, les sujets masculins n° 37 (fig. 112) et 200, et féminin n° 279 (fig. 182) de Fayoum pour le sous-groupe africain, le sujet masculin n° 935 (fig. 397) et le sujet féminin n° 243 de Fayoum pour le sous-groupe asiatique.

Sous-groupe (ABC)-AC

variété sub-anatolienne du sous-groupe sub-méditerranéen d'Asie

Distribution des sujets. Nous avons classé dans ce sous-groupe, 32 sujets masculins se répartissant comme suit :

Fayoum. Autochtones, adultes :

Nord-syriens, 2 sujets : n° 13, 15.

Autochtone, adolescent :

Nord-syrien, 1 sujet, n° 63.

Autochtones, garçons :

Nord-syriens, 8 sujets : n° 89, 92, 96, 98, 101, 113, 125, 130;
Arménoïde, 1 sujet, n° 136.

Non-autochtone, adulte :

Nord-syrien, 1 sujet, n° 188.

Non-autochtone, adolescent :

Cilicien, 1 sujet, n° 193.

[1] Robert-P. Charles, *op. cit.,* 1962, p. 33.

Non-autochtone, garçon :

Nord-syrien, 1 sujet, n° 196.

Sennouris. Autochtones, adultes :

Nord-syriens, 9 sujets : n° 419, 422, 427, 429, 434, 457, 458, 461, 467;
Ciliciens, 2 sujets : n° 423, 444.

Shak-Shuk. Autochtone, garçon :

Nord-syrien, 1 sujet, n° 629.

Beheira. Autochtones, adultes :

Nord-syriens, 2 sujets : n° 3, 20.

Autochtone, garçon :

Cilicien, 1 sujet, n° 32.

Non-autochtones, adultes :

Nord-syriens, 2 sujets : n° 867, 50.

Appartiennent également au sous-groupe (ABC)-AC, 31 sujets féminins :

Fayoum. Autochtones, adultes :

Nord-syriens, 2 sujets : n° 242, 262.

Autochtone, adolescente :

Nord-syrien, 1 sujet, n° 292.

Autochtones, filles :

Nord-syriens, 2 sujets : n° 344, 349.

Non-autochtone, fille :

Nord-syrien, 1 sujet, n° 374.

Shak-Shuk. Autochtones, adultes :

Nord-syriens, 2 sujets : 751, 753;
Ciliciens, 2 sujets : n° 737, 738.

KUTA. Autochtones, adultes :

Nord-syriens, 3 sujets : n° 938, 1028, 1046.

BEHEIRA. Autochtones, adultes :

Nord-syriens, 2 sujets : n° 83, 90 ;
Ciliciens, 2 sujets : n° 74, 76.

Autochtones, adolescentes :

Nord-syriens, 6 sujets : n° 101, 110, 112, 115, 120, 134 ;
Cilicien, 1 sujet, n° 98.

Autochtones, filles :

Nord-syriens, 3 sujets : n° 173, 175, 182 ;
Ciliciens, 2 sujets : n° 154, 172.

Non-autochtone, adulte :

Cilicien, 1 sujet, n° 188.

Non-autochtone, adolescente :

Nord-syrien, 1 sujet, n° 198.

CARACTÈRES INDEXABLES. L'étude statistique nous a permis d'établir les caractères anthropométriques moyens de la variété sub-anatolienne du sous-groupe sub-méditerranéen d'Asie, conformément au tableau suivant :

Indices (s/groupe (ABC)-AC)	sujets masc. n = 32		sujets fém. n = 31		Caractéristiques
	m	σ	m	σ	
céphalo-facial transversal ...	91,5	2,5	91,3	1,9	mésopside.
— — physionomique	87,3	3,7	86,3	2,2	métrio à hypsiprosope.
— — structural	54,9	0,9	54,8	1,1	hypsiène (par déf.).
facial total	91	3,5	93	2,5	lepto à hyperleptoprosope.
— supérieur	59	1,8	60	1,5	leptène.
nasal.....................	63	4,3	63,2	2,6	leptorhinien (par déf.).

Si l'on compare ces résultats à ceux que nous avions obtenus pour les sujets du même sous-groupe structural, étudiés dans le district occidental [1], on constate que ces derniers ont, d'une manière générale, le visage plus large que les sujets du Fayoum et de Beheira ; en revanche, ceux-ci ont le nez un peu plus large, ce qui est sensible surtout chez les femmes. Les différences métriques d'un sexe à l'autre sont du même ordre dans l'un et l'autre districts.

Nous considérons comme particulièrement caractéristiques du sous-groupe (ABC)-AC, le sujet masculin n° 444 de Sennouris et le sujet féminin n° 90 de Beheira (fig. 926).

Groupe A : Méditerranéen (cromagnoïde)

DISTRIBUTION DES SUJETS. Nous avions dénombré 137 sujets masculins et 218 sujets féminins, soit au total 355 sujets, que la valeur de leur indice céphalo-facial structural situait dans la classe des sujets chamæène, par conséquent attribuables au groupe A d'après la clef dichotomique [2]. La valeur des indices des sujets ainsi sélectionnés, permettait dans la plupart des cas d'établir un histogramme de forme régulière. Il n'en était pas de même pour l'indice nasal, qui se répartissait irrégulièrement avec une latitude de variation excessive, de 47 à 93. Aussi, en seconde analyse, nous n'avons conservé dans le groupe A que les sujets dont la valeur de l'indice nasal prenait place dans la partie principale de l'histogramme, celle-ci s'étendant de 58, 1 à 78,0.

Les sujets chamæènes dont la valeur de l'indice nasal sort de ces limites, sont des hybrides et ils seront considérés plus loin.

En fin d'analyse, nous avons classé dans le groupe A, 89 sujets masculins se répartissant comme suit :

FAYOUM. Autochtones, adultes :

Alpino-méditerranéens, 4 sujets : n° 33, 34, 51, 55.

[1] Robert-P. CHARLES, *op. cit.*, 1962, p. 37.
[2] Robert-P. CHARLES, *op. cit.*, 1962, pp. 18-19.

Autochtones, adolescents :

Méditerranéen ancien, 1 sujet, n° 58 ;
Alpino-méditerranéens, 2 sujets : n° 61, 62.

Autochtones, garçons :

Méditerranéens anciens, 10 sujets : n° 69, 77, 88, 100, 111, 112, 117, 128, 138, 150 ;
Alpino-méditerranéens, 11 sujets : n° 85, 90, 97, 99, 123, 124, 131, 137, 147, 148, 149 ;
Alpinoïdes, 4 sujets : n° 72, 84, 109, 120.

Non-autochtones, garçons :

Méditerranéens anciens, 4 sujets : n° 209, 210, 211, 220 ;
Alpino-méditerranéens, 10 sujets : n° 195, 197, 199, 201, 202, 205, 212, 214, 216, 218 ;
Alpinoïde, 1 sujet, n° 206.

SENNOURIS. Autochtones, adultes :

Méditerranéens anciens, 4 sujets : n° 453, 455, 460, 472 ;
Alpino-méditerranéens, 3 sujets : n° 431, 464, 468.

Autochtone, adolescent :

Méditerranéen ancien, 1 sujet, n° 475.

Autochtones, garçons :

Méditerranéens anciens, 3 sujets : n° 484, 489, 490 ;
Alpino-méditerranéens, 3 sujets : n° 477, 483, 487.

SHAK-SHUK. Autochtones, adultes :

Alpino-méditerranéens, 2 sujets : n° 627, 628.

KUTA. Autochtones, adultes :

Méditerranéens anciens, 10 sujets : n° 872, 886, 904, 907, 928, 942, 943, 946, 958, 960, 966 ;
Alpino-méditerranéens, 2 sujets : n° 944, 964.

Autochtone, adolescent :

Méditerranéen ancien, 1 sujet, n° 974.

Autochtone, garçon :

Méditerranéen ancien, 1 sujet, n° 975.

BEHEIRA. Autochtones, adultes :

Méditerranéens anciens, 2 sujets : n° 859, 26 ;
Alpino-méditerranéens, 2 sujets : n° 15, 23.

Autochtone, adolescent :

Alpino-méditerranéen, 1 sujet, n° 53.

Non-autochtone, adulte :

Alpino-méditerranéen, 1 sujet, n° 53.

Appartiennent également au groupe A, 170 sujets féminins :

FAYOUM. Autochtones, adultes :

Méditerranéen ancien, 1 sujet, n° 259 ;
Alpino-méditerranéens, 4 sujets : n° 250, 253, 260, 263.

Autochtones, adolescentes :

Méditerranéens anciens, 3 sujets : n° 268, 277, 295 ;
Alpino-méditerranéens, 12 sujets : n° 266, 270, 273, 275, 278, 281, 285, 287, 291, 293, 296, 297 ;
Alpinoïde, 1 sujet, n° 272.

Autochtones, filles :

Méditerranéens anciens, 9 sujets : n° 312, 318, 323, 329, 331, 338, 345, 350, 356 ;
Alpino-méditerranéens, 15 sujets : n° 307, 309, 325, 326, 327, 328, 332, 333, 335, 339, 340, 342, 343, 351, 358 ;
Alpinoïdes, 5 sujets : n° 311, 324, 341, 346, 354.

Non-autochtone, adulte :

Alpino-méditerranéen, 1 sujet, n° 359.

Non-autochtones, adolescentes :

Méditerranéen ancien, 1 sujet, n° 362 ;
Alpino-méditerranéens, 5 sujets : n° 365, 366, 368, 371, 372 ;
Alpinoïdes, 3 sujets : n° 363, 364, 369.

Non-autochtones, filles :

Méditerranéens anciens, 3 sujets : n° 381, 387, 390 ;
Alpino-méditerranéens, 11 sujets : n° 375, 385, 389, 393, 399, 402, 403, 405, 406, 411, 415 ;
Alpinoïdes, 9 sujets : n° 384, 391, 392, 398, 407, 408, 410, 412, 414.

Sennouris. Autochtones, adultes :

Méditerranéens anciens, 2 sujets : n° 505, 508.

Autochtones, filles :

Méditerranéens anciens, 9 sujets : n° 509, 512, 521, 524, 529, 545, 546, 554, 558 ;
Alpino-méditerranéens, 12 sujets : n° 522, 530, 531, 533, 535, 536, 538, 547, 549, 552, 555, 564 ;
Alpinoïdes, 9 sujets ; n° 384, 391, 392, 398, 407, 408, 410, 412, 414.

Sennouris. Autochtones, adultes :

Méditerranéens anciens, 2 sujets : n° 505, 508.

Autochtones, filles :

Méditerranéens anciens, 9 sujets : n° 509, 512, 521, 524, 529, 545, 546, 554, 558 ;
Alpino-méditerranéens, 12 sujets : n° 522, 530, 531, 533, 535, 536, 538, 547, 549, 552, 555, 564 ;
Alpinoïdes : 3 sujets : n° 511, 515, 565.

Non-autochtone, adulte :

Alpino-méditerranéen, 1 sujet, n° 598.

Non-autochtones, filles :

Méditerranéens anciens, 3 sujets : n° 600, 610, 612 ;
Alpino-méditerranéens, 3 sujets : n° 605, 613, 614.

Shak-Shuk. Autochtones, adultes :

Méditerranéens anciens, 4 sujets : n° 754, 757, 760, 761 ;
Alpino-méditerranéens, 5 sujets : n° 744, 748, 755, 764, 766.

Autochtones, adolescentes :

Méditerranéen ancien, 1 sujet, n° 773 ;
Alpino-méditerranéen, 1 sujet, n° 775.

Autochtone, fille :

Alpino-méditerranéen, 1 sujet, n° 778.

Non-autochtone, adolescente :

Méditerranéen ancien, 1 sujet, n° 818.

Kuta. Autochtones, adultes :

Méditerranéens anciens, 5 sujets : n° 1042, 1045, 1050, 1053, 1055 ;
Alpino-méditerranéens, 2 sujets : n° 1037, 1043 ;
Alpinoïde, 1 sujet, n° 1049.

Autochtones, adolescentes :

Méditerranéens anciens, 3 sujets : n° 1056, 1057, 1058.

Autochtone, fille :

Méditerranéen ancien, 1 sujet : n° 1059.

Beheira. Autochtones, adultes :

Méditerranéen ancien, 1 sujet, n° 92 ;
Alpino-méditerranéens, 3 sujets : n° 63, 64, 68, 73.

Autochtones, adolescentes :

Méditerranéens anciens, 4 sujets : n° 111, 141, 143, 149;
Alpino-méditerranéens, 5 sujets : n° 97, 107, 109, 127, 146.
Alpinoïdes, 3 sujets : n° 113, 123, 125.

Autochtones, filles :

Méditerranéens anciens, 3 sujets : n° 160, 177, 180;
Alpino-méditerranéens, 4 sujets : n° 157, 159, 164, 166.

Non-autochtone, adulte :

Alpino-méditerranéen, 1 sujet, n° 183.

Non-autochtones, adolescentes :

Méditerranéen ancien, 1 sujet : n° 202;
Alpino-méditerranéens, 2 sujets : n° 192, 194;
Alpinoïde, 1 sujet, n° 200.

Non-autochtone, fille :

Méditerranéen ancien, 1 sujet, n° 205.

Caractères indexables. L'étude statistique nous a permis d'établir les caractères anthropométriques moyens du groupe méditerranéen, conformément au tableau suivant :

Indices (groupe A)	sujets masc. n = 89		sujets fém. n = 170		Caractéristiques
	m	σ	m	σ	
céphalo-facial transversal ...	90,3	2,9	89,5	2,4	micro à mésopside.
— — physionomique	75,9	3	74,8	2,2	hyperchamæ à chamæprosope.
— — structural	48,3	1,6	47,6	0,6	chamæène (par déf.)
facial total	82,4	3,4	83,1	2,6	euryprosope.
— supérieur...........	51,7	1,8	51,1	1,8	euryène.
nasal....................	70	3,3	69,4	3,9	lepto à mésorhinien.

Si l'on compare ces résultats à ceux que nous avions obtenus pour les sujets du même groupe structural, étudiés dans le district occidental[1], on constate que ces derniers ont, d'une manière générale, le visage plus étroit — et aussi le nez plus fin — que les sujets du Fayoum et de Beheira. En revanche, les différences métriques d'un sexe à l'autre, sont du même ordre dans l'un et l'autre districts.

Nous considérons comme particulièrement caractéristiques du groupe A, le sujet masculin n° 69 de Fayoum et le sujet féminin n° 773 de Shak-Shuk (fig. 811).

Groupe AB : Nord-saharien

Distribution des sujets. Nous avons classé dans ce groupe, 40 sujets masculins, se répartissant comme suit :

Fayoum. Autochtones, adultes :

Nord-Sahariens, 3 sujets : n° 19, 37, 39;
Sahariens, 3 sujets : n° 20, 21, 52.

Autochtones, garçons :

Nord-sahariens, 6 sujets : n° 64, 65, 91, 95, 116, 122;
Saharien, 1 sujet, n° 141.

Non-autochtone, adulte :

Nord-saharien, 1 sujet, n° 189.

Non-autochtones, garçons :

Nord-saharien, 1 sujet, n° 208;
Saharien des Oasis, 1 sujet : n° 207.

Kuta. Autochtones, adultes :

Nord-sahariens, 10 sujets : n° 877, 888, 901, 910, 914, 931, 939, 948, 952, 965;
Saharien, 1 sujet, n° 920.

[1] Robert-P. Charles, *op. cit.*, 1962, p. 41.

Non-autochtones, adultes :

Nord-sahariens, 4 sujets : n° 999, 1005, 1017, 1022;
Saharien, 1 sujet, n° 1002.

Beheira. Autochtones, adultes :

Nord-sahariens, 3 sujets : n° 848, 4, 5;
Saharien, 1 sujet, n° 9.

Non-autochtones, adultes :

Nord-sahariens, 2 sujets : n° 35, 44;
Sahariens, 2 sujets : n° 860, 34.

Appartiennent également au groupe AB, 25 sujets féminins :

Fayoum. Autochtone, adulte :

Nord-saharien, 1 sujet, n° 244.

Autochtone, adolescente :

Saharien, 1 sujet, n° 299.

Autochtones, filles :

Nord-sahariens, 2 sujets : n° 310, 337;
Sahariens, 2 sujets : n° 306, 330.

Non-autochtone, adulte :

Nord-saharien, 1 sujet, n° 360.

Sennouris. Autochtones, filles :

Nord-sahariens, 2 sujets : n° 534, 557;
Sahariens, 3 sujets : n° 514, 527, 532.

Non-autochtones, filles :

Nord-sahariens, 3 sujets : n° 602, 604, 608.

Shak-Shuk. Autochtones, adultes :

Nord-saharien, 1 sujet, n° 750;
Saharien, 1 sujet, n° 769.

Kuta. Autochtones, adultes :

Nord-sahariens, 3 sujets : n° 1031, 1036, 1047.

Beheira. Autochtones, adolescentes :

Nord-sahariens, 2 sujets : n° 108, 139.

Autochtone, fille :

Saharien des Oasis, 1 sujet, n° 169.

Non-autochtone, adolescente :

Nord-saharien, 1 sujet, n° 195.

Non-autochtone, fille :

Nord-saharien, 1 sujet, n° 207.

Caractères indexables. L'étude statistique nous a permis d'établir les caractères anthropométriques moyen du groupe nord-saharien, conformément au tableau suivant :

Indices (groupe AB)	sujets masc. n = 40		sujets fém. n = 25		Caractéristiques
	m	σ	m	σ	
céphalo-facial transversal ...	92,6	2,1	91	2	mésopside.
— — physionomique	78,7	1,6	78,4	2,1	chamæprosope (par déf.).
— — structural	50,6	1,2	50,6	1,2	métriène (par déf.).
facial total	82,1	2,7	82,8	2,7	mésoprosope.
— supérieur...........	54,1	1,6	54,1	1,6	mésène.
nasal....................	74,4	2,7	74,5	2,7	mésorhinien (par déf.).

Dans le district occidental, nous n'avions déterminé que 12 sujets masculins et 7 sujets féminins appartenant au groupe AB. Ces chiffres étaient trop faibles pour permettre une étude statistique. L'étude des sujets du Fayoum et de Béheira nous apporte donc de nouvelles précisions; toutefois, les moyennes de fréquence obtenues se trouvent comprises dans les marges de variations notées précédemment [1]. Dans l'ensemble, les résultats enregistrés dans l'une et l'autre séries sont concordants, et l'on remarque qu'il n'y a que très peu de différences entre les chiffres obtenus pour la série de sujets masculins et ceux obtenus pour la série de sujets féminins.

Nous considérons comme particulièrement caractéristiques du groupe AB, le sujet masculin n° 189 et le sujet féminin n° 337 de Fayoum (fig. 20).

Groupe BC : Nilotique

Distribution des sujets. Nous avons classé dans ce groupe, 90 sujets masculins se répartissant comme suit :

Fayoum. Autochtones, adultes :

Nord-nilotiques, 3 sujets : n° 6, 28, 48 ;
Nubiens, 4 sujets : n° 31, 41, 42, 47.

Autochtone, adolescent :

Nubien, 1 sujet, n° 59.

Autochtones, garçons :

Nord-nubiens, 10 sujets : n° 68, 80, 81, 87, 119, 121, 126, 129, 132, 142 ;
Nubien, 1 sujet, n° 75.

Non-autochtone, adulte :

Nord-nilotique, 1 sujet, n° 187.

[1] Robert-P. Charles, *op. cit.,* 1962, p. 44.

Non-autochtone, adolescent :

Nord-nilotique, 1 sujet, n° 190.

Sennouris. Autochtones, adultes :

Nord-nilotiques, 7 sujets : n° 433, 440, 442, 447, 452, 459, 462.

Autochtone, adolescent :

Nubien, 1 sujet, n° 474.

Kuta. Autochtones, adultes :

Nord-nilotiques, 25 sujets : n° 873, 875, 882, 883, 884, 885, 890, 894, 896, 903, 912, 916, 925, 926, 927, 933, 940, 941, 945, 949, 953, 957, 961, 968, 969 ;
Nubiens, 3 sujets : n° 876, 954, 955 ;
Nubien des Oasis, 1 sujet, n° 915.

Autochtones, adolescents :

Nord-nilotiques, 2 sujets : n° 971, 972.

Non-autochtones, adultes :

Nord-nilotiques, 7 sujets : n° 981, 984, 985, 997, 1009, 1014, 1018 ;
Nubiens, 2 sujets : n° 1000, 1008.

Beheira. Autochtones, adultes :

Nord-nilotiques, 12 sujets : n° 834, 847, 850, 853, 854, 855, 856, 858, 6, 11, 12, 24 ;
Nubiens, 3 sujets : n° 831, 852, 19.

Autochtone, adolescent :

Nord-nilotique, 1 sujet, n° 30.

Non-autochtones, adultes :

Nord-nilotiques, 4 sujets : n° 863, 865, 870, 51 ;
Nubien, 1 sujet : n° 41.

Appartiennent également au groupe BC, 35 sujets féminins :

Fayoum. Autochtones, adultes :

Nord-nilotique, 1 sujet, n° 245;
Nubiens, 2 sujets : n° 254, 261.

Autochtones, adolescentes :

Nord-nilotiques, 4 sujets : n° 264, 282, 283, 294.

Autochtones, filles :

Nord-nilotiques, 4 sujets : n° 304, 315, 316, 322;
Nubien, 1 sujet : n° 317.

Sennouris. Autochtones, filles :

Nord-nilotiques, 2 sujets : n° 523, 559;
Nubien, 1 sujet, n° 518.

Shak-Shuk. Autochtone, adulte :

Nord-nilotique, 1 sujet : n° 741.

Autochtone, adolescente :

Nord-nilotique, 1 sujet : n° 768.

Autochtone, fille :

Nord-nilotique, 1 sujet : n° 779.

Non-autochtone, adulte :

Nubien, 1 sujet, n° 816.

Kuta. Autochtone, adulte :

Nord-nilotique, 1 sujet, n° 1041.

Beheira. Autochtones, adultes :

Nord-nilotiques, 5 sujets : n° 57, 59, 60, 62, 91.

Autochtone, adolescente :

Nord-nilotique, 1 sujet : n° 129.

Autochtones, filles :

Nord-nilotiques, 4 sujets : n° 96, 124, 147, 148;
Nubiens, 2 sujets : n° 168, 174.

Non-autochtones, adultes :

Nord-nilotique, 1 sujet, n° 189;
Nubien, 1 sujet, n° 186.

Non-autochtone, fille :

Nord-nilotique, 1 sujet, n° 203.

Caractères indexables. L'étude statistique nous a permis d'établir les caractères anthropométriques moyens du groupe nilotique, conformément au tableau suivant :

Indices (groupe BC)	sujets masc. n = 90		sujets fém. n = 35		Caractéristiques
	m	σ	m	σ	
céphalo-facial transversal ...	94,1	2,6	91,4	2,7	méso à macropside.
— — physionomique	82,3	1,4	82,3	1,4	métrioprosope.
— — structural	51,4	1,3	51,4	1,3	métriène (par déf.).
facial total	86,9	3	87	2,9	mésoprosope.
— supérieur...........	53,3	1,7	56	1,5	mésène.
nasal.....................	72,9	2,7	72,4	2,8	mésorhinien (par déf.).

Dans le district occidental, nous n'avions déterminé que 42 sujets masculins et 3 sujets féminins appartenant au groupe BC. Ce dernier chiffre était trop faible pour permettre une étude statistique, aussi l'étude des sujets du Fayoum et de Beheira nous apporte-t-elle de nouvelles précisions sur les sujets féminins du groupe BC.

Si l'on compare aux résultats précédemment obtenus [1], il apparaît que les hommes ont le visage plus grand que dans le district occidental, à la fois plus large et plus haut par rapport à la tête, plus large dans ses proportions ; en revanche, le nez est un peu moins large.

Les femmes ont le visage plus étroit que les hommes, mais avec un développement en hauteur identique à celui de ces derniers ; le nez est aussi un peu moins large.

Nous considérons comme particulièrement caractéristique du groupe BC, le sujet masculin n° 452 de Sennouris (fig. 619) et le sujet féminin n° 59 de Beheira.

Sous-groupe (ABC)-BC

variété kamitique du groupe nilotique

Distribution des sujets. Nous avons classé dans ce sous-groupe, 27 sujets masculins se répartissant comme suit :

Fayoum. Autochtones, adultes :

Kamito-nilotiques, 3 sujets : n° 4, 23, 45 ;
Kamito-nubien, 1 sujet, n° 54.

Autochtones, garçons :

Kamito-nilotiques, 3 sujets : n° 102, 104, 134.

Non-autochtone, adulte :

Kamito-nilotique, 1 sujet, n° 185.

Sennouris. Autochtones, adultes :

Kamito-nilotiques, 4 sujets : n° 426, 432, 438, 469.

Autochtone, garçon :

Kamito-nilotique, 1 sujet, n° 481.

[1] Robert-P. Charles, *op. cit.,* 1962, p. 47.

Shak-Shuk. Non-autochtone, adulte :

Kamito-nilotique, 1 sujet, n° 716.

Kuta. Autochtones, adultes :

Kamito-nilotiques, 9 sujets : n° 871, 887, 905, 906, 917, 918, 929, 930, 934.

Non-autochtones, adultes :

Kamito-nilotiques, 2 sujets : n° 1012, 1013.
Kamito-nubien, 1 sujet, n° 1011.

Beheira. Autochtone, adulte :

Kamito-nubien des Oasis, 1 sujet, n° 829.

Appartiennent également à ce groupe 13 sujets féminins :

Fayoum. Autochtone, fille :

Kamito-nilotique, 1 sujet, n° 302.

Non-autochtone, fille :

Kamito-nilotique, 1 sujet, n° 404.

Shak-Shuk. Autochtone, adulte :

Kamito-nilotique, 1 sujet, n° 762.

Kuta. Autochtone, adulte :

Kamito-nilotique, 1 sujet, n° 1026.

Beheira. Autochtone, adulte :

Kamito-nilotique, 1 sujet, n° 69.

Autochtones, adolescentes :

Kamito-nilotiques, 2 sujet : n° 100, 142;
Kamito-nubiens, 2 sujets : n° 99, 128.

Autochtones, filles :

Kamito-nilotiques, 2 sujets : n° 158, 161.

Non-autochtone, adulte :

Kamito-nilotique, 1 sujet, n° 184.

Non-autochtone, adolescente :

Kamito-nilotique, 1 sujet, n° 193.

Caractères indexables. Les chiffres de chaque série partielle étant un peu faibles, nous n'avons pas pu considérer séparément les caractères métriques de deux sexes. Nous avons donc étudié statistiquement une série unique, en notant qu'il n'y avait pas de différence métrique significative d'un sexe à l'autre. Nous avons établi les caractères anthropométriques moyens de la variété kamitique du groupe nilotique, conformément au tableau suivant :

Indices (s/groupe (ABC)-BC)	n=23+13		Caractéristiques
	m	σ	
céphalo-facial transversal	94,5	3,5	macropside.
— — physionomique......	84,8	2,6	hypsiprosope.
— — structural	54,8	0,8	hypsiène (par définition).
facial total......................	90	3	leptoprosope.
— supérieur	57	2	mésène à leptène.
nasal	73	3	mésorhinien.

Ces chiffres précisent les données que nous avions d'après les sujets étudiés dans le district occidental.

Nous considérons comme particulièrement représentatifs de ce sous-groupe, le sujet masculin n° 54 du Fayoum et le sujet féminin n° 1026 de Kuta.

Groupe B : Soudanais

Distribution des sujets. Nous avons classé dans ce groupe, 16 sujets masculins se répartissant comme suit :

Fayoum. Autochtone, adulte :

Soudanais, 1 sujet, n° 43.

Autochtone, garçon :

Soudanais, 1 sujet, n° 143.

Non-autochtone, garçon :

Soudanais, 1 sujet, n° 203.

Sennouris. Autochtones, adultes :

Soudanais, 3 sujets : n° 428, 439, 450.

Kuta. Autochtones, adultes :

Soudanais, 3 sujets : n° 899, 911, 923.

Non-autochtones, adultes :

Soudanais, 4 sujets : n° 982, 990, 1020, 1023.

Beheira. Autochtone, adulte :

Soudanais, 1 sujet, n° 835.

Appartiennent également à ce groupe, 2 sujets féminins :

Kuta. Autochtone, adulte :

Soudanais, 1 sujet, n° 1051.

Beheira. Autochtone, adulte :

Soudanais, 1 sujet, n° 70.

Caractères indexables. Il n'est pas possible d'étudier statistiquement une série aussi faible; il nous est néanmoins possible d'indiquer les caractères anthropométriques de la majorité des sujets, en rassemblant les résultats dans le tableau ci-dessous :

Indices (groupe B)	n = 14 + 2	Caractéristiques
céphalo-facial transversal	95-97	macropside à hypermacropside.
— — physionomique......	80-83	métrioprosope.
— — structural	51-52	métriène (par définition).
facial total......................	85-88	méso à leptoprosope.
— supérieur	52-53	mésène.
nasal	86-89	platyrhinien (par définition).

Les caractères ainsi mis en évidence, correspondent à ceux que nous avions déjà notés pour ce groupe dans le district occidental[1] ; tout au plus, peut-on remarquer que ces derniers avaient le visage un peu moins large.

Nous considérons comme particulièrement caractéristiques du groupe B, le sujet masculin n° 1023 de Kuta (fig. 393) et le sujet féminin n° 70 de Beheira.

Sous-groupe (ABC)-B : Kamito-soudanais

Dans notre précédente enquête[2], nous n'avions trouvé qu'un seul sujet à classer dans ce sous-groupe. Il y en a quatre parmi les populations considérées ici, ce qui nous permet de préciser certains caractères.

Diagnose. Les sujets de ce sous-groupe, se caractérisent par un fort développement du massif facial qui est comme projeté en avant, mais d'une façon plus harmonieuse que dans le groupe principal[3]. La voûte crânienne est assez haute, et surtout étroite, avec des contours très arrondis.

[1] Robert-P. Charles, *op. cit.*, 1962, p. 51.
[2] Robert-P. Charles, *op. cit.*, 1962, p. 52.
[3] Cf. diagnose du groupe B, *in op. cit.*, 1962, p. 50.

La face est fortement développée, sa largeur pouvant dépasser celle de la tête. Dans ses proportions, l'ensemble du visage est assez variable, en raison de la variabilité relative du développement du menton; le contour général est ovale, avec la pointe mentonienne plus ou moins marquées. La partie supérieure est moyenne, quelquefois un peu allongée. D'une manière générale, le prognathisme sous-nasal n'est pas sensiblement plus marqué que le prognathisme total. Le nez est grand et large, le dos est légèrement concave, surmonté par une large ensellure; la pointe peut être légèrement retombante. Les paupières supérieures portent généralement un fort repli qui recouvre entièrement le tarse, et l'on observe la présence d'une bride externe. La bouche est grande avec des lèvres épaisses, celles-ci étant moins éversées que dans le groupe principal. Ainsi qu'il a été signalé plus haut, le menton est généralement rond, mais avec le lobule souvent plus développé que dans le groupe principal.

Les cheveux sont brun foncé à noir, très frisés ou crépus, mais nous n'avons pas rencontré le type laineux, présent dans le groupe principal. Les sujets du sous-groupe kamito-soudanais ont donc par ces caractères, et par ceux de la bouche, un aspect négroïde moins accusé que les sujets du groupe soudanais proprement-dit.

Distribution des sujets. Dans la série que nous venons d'étudier, le sous-groupe (ABC)-B est représenté par 3 sujets masculins et 1 sujet féminin, tous dolichocéphales, se répartissant comme suit :

Fayoum. Autochtone, adulte :

Kamito-soudanais, 1 sujet, n° 14.

Autochtone, adolescente :

Kamito-soudanais, 1 sujet, n° 284.

Kuta. Autochtone, adulte :

Kamito-soudanais, 1 sujet, n° 891.

Beheira. Non-autochtone, adulte :

Kamito-soudanais, 1 sujet, n° 37.

CARACTÈRES INDEXABLES. Il n'est pas possible sur une série aussi faible de faire une étude statistique ; nous nous contenterons donc d'indiquer les limites entre lesquelles oscillent les caractères anthropométriques de la plupart des sujets en rassemblant les résultats dans le tableau suivant :

Indices (s/groupe (ABC)-B)	n = 5	Caractéristiques
céphalo-facial transversal	95-105	hyper à ultramacropside.
— — physionomique......	84-86	hypsiprosope.
— — structural	54-56	hypsiène (par définition).
facial total.....................	82-89	eury à leptoprosope.
— supérieur	54-57	mésène à leptène.
nasal	85-91	platyrhinien (par définition).

Nous considérons comme particulièrement caractéristique du sous-groupe kamito-soudanais, le sujet masculin n° 891 de Kuta (fig. 407) et le sujet masculin n° 37 de Béheira (fig. 1144).

Sujets hybrides

Les caractères d'hybridation sont difficiles à reconnaître sur les sujets vivants en se fondant uniquement sur les indices anthropométriques [1]. Néanmoins, ainsi qu'il a été dit plus haut, d'après l'étude de la courbe de fréquence de l'indice nasal chez les sujets chamæènes, nous avons pu mettre en évidence que, seuls ceux dont l'indice nasal avait une valeur située de 58,1 à 78,0, appartenaient au groupe A *sensu stricto*.

1. *Hybrides du groupe A et d'un groupe négroïde* (*B, AB, BC,* (*ABC*)-*B,* (*ABC*)-*BC*).

Nous considérons comme tels, les sujets chamæènes dont la valeur de l'indice nasal est supérieure à 78,0 ; il n'est pas possible de préciser

[1] Ceci est en revanche, relativement aisé d'après l'étude du crâne osseux, cf. *in* R.P. CHARLES, L'Anthropologie archéologique, *op. cit.,* 1966, pp. 519-521.

le groupe négroïde intervenant dans chaque cas : nous verrons plus loin que cela ne gêne pas les considérations sur les affinités des sujets.

Nous classons ici, 51 sujets masculins se répartissant comme suit :

FAYOUM. Autochtones, adultes :

Dolichocéphales, 3 sujets : n° 22, 49, 50 ;
Mésocéphales, 2 sujets : n° 26, 30.

Autochtones, adolescents :

Mésocéphales, 2 sujets : n° 56, 60.

Autochtones, garçons :

Dolichocéphales, 5 sujets : n° 67, 79, 118, 133, 139 ;
Mésocéphale, 1 sujet, n° 145 ;
Brachycéphale, 1 sujet, n° 110.

Non-autochtone, adulte :

Dolichocéphale, 1 sujet, n° 183.

Non-autochtones, garçons :

Mésocéphales, 2 sujets : n° 215, 217.

SENNOURIS. Autochtones, adultes :

Dolichocéphales, 6 sujets : n° 435, 436, 449, 454, 456, 466 ;
Mésocéphale, 1 sujet, n° 463.

Autochtones, garçons :

Mésocéphales, 5 sujets : n° 480, 482, 485, 486, 488.

KUTA. Autochtones, adultes :

Dolichocéphales, 5 sujets : n° 889, 900, 922, 959, 967 ;
Mésocéphale, 1 sujet, n° 947.

Autochtone, adolescent :

Dolichocéphale, 1 sujet, n° 973.

Autochtones, garçons :

Dolichocéphale, 1 sujet, n° 978;
Brachycéphale, 1 sujet, n° 977.

Non-autochtones, adultes :

Dolichocéphales, 5 sujets : 989, 992, 998, 1007, 1016;
Mésocéphale, 1 sujet, n° 986.

Non-autochtones, adolescents :

Dolichocéphales, 2 sujets : n° 1024, 1025.

Beheira. Autochtone, adulte :

Dolichocéphale, 1 sujet, n° 844.

Autochtone, adolescent :

Mésocéphale, 1 sujet, n° 31.

Autochtone, garçon :

Dolichocéphale, 1 sujet, n° 33.

Non-autochtones, adultes :

Dolichocéphale, 1 sujet, n° 52;
Mésocéphale, 1 sujet, n° 48.

Nous classons sous cette même rubrique, 35 sujets féminins :

Fayoum. Autochtone, adulte :

Dolichocéphale, 1 sujet, n° 252.

Autochtones, adolescentes :

Dolichocéphales, 2 sujets : n° 269, 271.

Autochtones, filles :

Dolichocéphales, 2 sujets : n° 301, 348;
Mésocéphales, 2 sujets : n° 320, 361.

Non-autochtone, adolescente :

Dolichocéphale, 1 sujet, n° 367.

Non-autochtones, filles :

Mésocéphales, 2 sujets : n° 377, 397;
Brachycéphale, 1 sujet, n° 409.

Sennouris. Autochtones, filles :

Dolichocéphale, 1 sujet, n° 563;
Mésocéphales, 2 sujets : n° 537, 542.

Non-autochtone, fille :

Dolichocéphale, 1 sujet : n° 601.

Shak-Shuk. Autochtones, adultes :

Dolichocéphales, 2 sujets : n° 739, 765;
Mésocéphale, 1 sujet, n° 752.

Autochtones, filles :

Dolichocéphales, 2 sujets : n° 776, 777.

Kuta. Autochtone, adulte :

Dolichocéphale, 1 sujet, n° 1052.

Beheira. Autochtone, adulte :

Dolichocéphale, 1 sujet, n° 93.

Autochtones, adolescentes :

Dolichocéphales, 2 sujets : n° 103, 118;
Mésocéphales, 3 sujets : n° 102, 126, 145.

Autochtones, filles :

Dolichocéphales, 2 sujets : n° 155, 176;
Mésocéphale, 1 sujet, n° 167.

Non-autochtone, adulte :

Dolichocéphale, 1 sujet, n° 187.

Non-autochtones, adolescentes :

Dolichocéphale, 1 sujet, n° 191;
Mésocéphale, 1 sujet, n° 201.

Non-autochtones, filles :

Dolichocéphales, 2 sujets : n° 206, 208.

2. *Hybrides du groupe A et du groupe AC.*

Nous considérons comme tels, les sujets chamæènes dont la valeur de l'indice nasal est au plus égale à 58,0. Il n'est pas possible de préciser les affinités, africaines ou asiatiques, du sous-groupe intervenant dans chaque cas. Nous nous contenterons de qualifier ces sujets de subméditerranéens.

Nous avons ainsi classé 11 sujets féminins se répartissant comme suit :

Fayoum. Non-autochtones, filles :

Dolichocéphale, 1 sujet, n° 380.
Brachycéphale, 1 sujet, n° 394.

Sennouris. Autochtone, fille :

Brachycéphale, 1 sujet, n° 556.

Shak-Shuk. Non-autochtone, fille :

Dolichocéphale, 1 sujet, n° 819.

Beheira. Autochtones, adultes :

Dolichocéphales, 4 sujets : n° 81, 82, 87, 89;
Mésocéphales, 2 sujets : n° 80, 86.

Autochtone, fille :

Brachycéphale, 1 sujet : n° 181.

COMPOSITION DE LA POPULATION

Pour interpréter les résultats fournis par l'étude systématique, il convient de procéder à des sélections et à des regroupements, de façon à mettre en évidence les caractères propres à chaque élément de population. Nous considérerons successivement les sujets autochtones du Fayoum, c'est-à-dire localités de Médinet el-Fayoum, Sennouris, et Shak-Shuk, où la présente enquête a été faite ; les sujets non-autochtones du Fayoum ; les bédouins Kuta ; et enfin, la population autochtone et non-autochtone de l'oasis de Beheira.

I. La population autochtone du Fayoum.

De la ville même de Médinet el-Fayoum, nous avons une série de 261 sujets. Le groupe A est nettement prédominant avec 80 sujets représentant 30, 63% de la population autochtone (34, 65% si l'on tient compte des hybrides) ; vient ensuite le groupe AC qui, avec 54 sujets représente 20,65% auxquels il convient d'adjoindre les 6,51% que représentent les 17 sujets du sous-groupe (ABC)-AC ; le groupe ABC, avec 27 sujets, représente 10, 34%. Les éléments plus ou moins négroïdes ont une importance variable et non négligeable : le groupe AB, avec 19 sujets, compte pour 7,27% ; le groupe BC, avec 31 sujets, représente 11,87% auxquels il convient d'ajouter les 3,06% que représentent les 8 sujets du sous-groupe (ABC)-BC ; le groupe B et le sous-groupe (ABC)-B, représentés chacun par 2 sujets, comptent respectivement pour 0,76%. Enfin, les groupes sub-négroïdes sans distinction, se manifestent par 4,02% chez les hybrides.

Médinet el-Fayoum	hommes			femmes			Total	
	Ad.	20/18	17/14	Ad.	20/18	17/14		
ABC. Dolichocéphales	11	1	4	1	—	1	18	6,89 %
Mésocéphales	6	—	—	2	1	—	9	3,45 %
AC, Kamitiques	2	—	1	1	—	—	4	1,53 %
Africains : Libyco-berbères ..	1	—	3	—	2	4	10	3,81 %
Berbéro-telliens ..	1	—	—	—	2	—	3	1,14 %
AC, Sud-orientaux. ...	2	—	8	1	4	2	17	6,51 %
Asiatiques : Syro-cananéens. ..	2	—	7	2	2	6	19	7,28 %
Syro-arménoïde ..	—	—	1	—	—	—	1	0,38 %
(ABC)-AC. Nord-syriens	2	1	8	2	1	2	16	6,13 %
Arménoïde	—	—	1	—	—	—	1	0,38 %
A. Méditerranéens anciens . .	—	1	10	1	1	9	22	8,42 %
Alpino-méditerranéens ...	4	2	11	4	12	15	48	18,4 %
Alpinoïdes.	—	—	4	—	1	5	10	3,81 %
AB. Nord-sahariens	3	—	6	1	—	2	12	4,59 %
Sahariens	3	—	1	—	1	2	7	2,68 %
BC. Nord-nilotiques	3	—	10	1	4	4	22	8,42 %
Nubiens................	4	1	1	2	—	1	9	3,45 %
(ABC)-BC. Kamito-nilotiques	3	—	3	—	—	1	7	2,68 %
Kamito-nubien ...	1	—	—	—	—	—	1	0,38 %
B. Soudanais	1	—	1	—	—	—	2	0,76 %
(ABC)-B. Kamito-soudanais	1	—	—	—	1	—	2	0,76 %
Hybrides de A et négroïde :								
Dolichocéphales ..	3	—	5	1	2	2	13	4,98 %
Mésocéphales	2	2	1	—	—	2	7	2,68 %
Brachycéphale. ...	—	—	1	—	—	—	1	0,38 %
TOTAL ...	55	8	87	19	34	58	261	

En sélectionnant les sujets d'après leurs affinités géographiques, nous pouvons distinguer :

1. *Eléments autochtones de type africain sans caractères négroïdes* : nous devons classer ici les 27 sujets du groupe ABC et les 17 sujets du sous-groupe africain du groupe AC, soit au total 44 sujets qui représentent 16,87% de la population.

2. *Eléments autochtones de type africain présentant des caractères négroïdes plus ou moins accusés :* nous devons classer ici les 19 sujets du groupe AB, les 31 sujets du groupe BC, les 8 sujets du sous-groupe (ABC)-BC, les 2 sujets du groupe B et les 2 sujets du sous-groupe (ABC)-B. Cet ensemble de 62 sujets représente 25,72% de la population ; on doit ajouter à ce chiffre, les 4,02% qui représentent l'influence des sub-négroïdes chez les hybrides. En fin d'analyse, nous trouvons une proportion totale de 29,74% de sub-négroïdes.

3. *Eléments autochtones de type méditerranéen :* nous devons classer ici 22 sujets de type méditerranéen ancien et 48 sujets de type alpino-méditerranéen, soit 70 sujets représentant 26,83% ; on doit y adjoindre les 3,383% qui représentent l'influence de ces types chez les hybrides. Nous trouvons donc au total 30,66% de Méditerranéens.

4. *Eléments présentant des affinités cananéennes :* nous classons ici les 37 sujets du sous-groupe asiatique du groupe AC, les 17 sujets du sous-groupe (ABC)-AC, et les 10 sujets de type alpinoïde [1], soit 64 sujets représentant 24,52%, auxquels on doit ajouter 0,19% représentant l'influence du type alpinoïde chez les hybrides. Nous trouvons au total, que l'influence cananéenne se manifeste chez 24,71% des sujets dans la population autochtone de Médinet el-Fayoum.

Enfin, indépendamment des affinités typologiques, nous devons considérer les classes d'indice céphalique, de façon à préciser l'importance relative des influences, maritime, sub-littorale et continentale [2]. Nous trouvons la distribution suivante :

Dolichocéphales, 135 sujets, soit 51,73% de la population ;
Mésocéphales, 110 sujets, soit 42,13% de la population ;
Brachycéphales, 16 sujets, soit 6,14% de la population.

[1] Nous avons en effet mis en évidence que le type alpinoïde n'est pas autochtone en Egypte, mais d'origine syro-libanaise ; cf. Robert-P. CHARLES, Contribution à l'Anthropologie de l'Egypte ancienne, *Bull. Soc. de Géogr. d'Egypte*, t. XXXIV, 1961, p. 219.

[2] Robert-P. CHARLES, Le Peuplement de l'Europe méditerranéenne pendant les IIIe et IIe millénaires avant Jésus-Christ, *Bull. et Mém. Soc. d'Anthrop. de Paris*, XIe série, t. I, 1960, pp. 152-153.

On voit qu'il y a une légère prédominance des Dolichocéphales sur les Mésocéphales, et une très faible proportion de Brachycéphales. La population autochtone de Médinet el-Fayoum présente donc des caractères de population sub-littorale, largement ouverte aux influences maritimes, ce qu'expliquent parfaitement les conditions géographiques locales.

La documentation sur les bourgs de Sennouris et de Shak-Shuk est inégale, aussi nous la regrouperons en un seul tableau (ci-contre) qui donnera une image de la population autochtone du Fayoum, autre que celle du chef-lieu administratif.

En considérant les groupes dans leur ensemble, on voit que sur une série de 192 sujets, le groupe ABC, avec 10 sujets, représente 5,20% de la population; le groupe AC, avec 58 sujets, compte pour 30,21% auxquels il convient d'ajouter les 8,85% correspondant aux 17 sujets du sous-groupe (ABC)-AC, et 0,26% représentant l'influence du groupe AC chez les hybrides; le groupe A avec 54 sujets, représente 28,11% auxquels on doit ajouter 5,73% qui représentent l'influence du groupe A chez les hybrides; le groupe AB, avec 7 sujets, compte pour 3,64%; le groupe BC, avec 14 sujets, représente 7,29% auxquels il convient d'ajouter 3,64% pour les 7 sujets du sous-groupe (ABC)-BC; et le groupe B, avec 3 sujets, ne compte que pour 1,56%. Enfin les groupes sub-négroïdes se manifestent chez les hybrides pour 5,47%.

En sélectionnant les sujets d'après leurs affinités géographiques, on arrive à la répartition suivante :

1. *Eléments autochtones de type africain sans caractères négroïdes :* nous devons réunir ici les 10 sujets du groupe ABC et les 15 sujets du sous-groupe africain du groupe AC, soit au total 25 sujets représentant 13,53% de la population des bourgs du Fayoum.

2. *Eléments autochtones de type africain présentant des caractères négroïdes plus ou moins accusés :* nous devons regrouper ici les 7 sujets du groupe AB, les 14 sujets du groupe BC, les 7 sujets du sous-groupe (ABC)-BC, et les trois sujets du groupe B, soit au total 31 sujets représentant 16,15%, auxquels il convient d'ajouter les 5,47% chiffrant l'influence des groupes sub-négroïdes chez les hybrides. En fin d'analyse, il y a lieu de retenir la présence de 21,62% de sujets plus ou moins négroïdes.

Bourgs du Fayoum	Sennouris					Shak-Shuk					Total	
	hommes			femmes		hommes		femmes				
	Ad.	20/18	17/14	Ad.	17/14	Ad.	17/14	Ad.	20/18	17/14		
ABC. Dolichocéphales	4	—	—	1	—	—	—	1	—	1	7	3,64 %
Mésocéphales	2	—	—	1	—	—	—	—	—	—	3	1,56 %
AC, Kamitiques	4	—	—	1	1	—	—	—	—	—	6	3,12 %
Africains : Libyco-berbères	2	1	—	1	3	—	—	2	—	—	9	4,69 %
Berbéro-tellien	—	—	—	—	—	—	—	—	1	—	1	0,52 %
AC, Sud-orientaux	2	—	—	1	13	—	—	5	2	—	23	11,98 %
Asiatiques : Syro-cananéens	2	1	1	—	6	—	—	7	1	—	18	9,38 %
Syro-arménoïde	—	—	—	—	1	—	—	—	—	—	1	0,52 %
(ABC)-AC. Nord-syriens	9	—	—	—	—	1	1	2	—	—	13	6,77 %
Ciliciens	2	—	—	—	—	—	—	2	—	—	4	2,08 %
A. Méditerranéens anciens	4	1	3	2	9	—	—	4	1	—	24	12,50 %
Alpino-méditerranéens	3	—	3	—	12	2	—	5	1	1	27	14,05 %
Alpinoïdes	—	—	—	—	3	—	—	—	—	—	3	1,56 %
AB. Nord-sahariens	—	—	—	—	2	—	—	1	—	—	3	1,56 %
Sahariens	—	—	—	—	3	—	—	1	—	—	4	2,08 %
BC. Nord-nilotiques	7	—	—	—	2	—	—	1	1	1	12	6,25 %
Nubiens	—	1	—	—	1	—	—	—	—	—	2	1,04 %
(ABC)-BC. Kamito-nilotiques	4	—	1	—	—	1	—	1	—	—	7	3,64 %
B. Soudanais	3	—	—	—	—	—	—	—	—	—	3	1,56 %
Hybrides de A et négroïdes :												
Dolichocéphales	6	—	—	1	1	—	—	2	—	2	12	6,25 %
Mésocéphales	1	—	5	2	—	—	—	1	—	—	9	4,69 %
Hybride de A et AC :												
Brachycéphale	—	—	—	—	1	—	—	—	—	—	1	0,52 %
TOTAL	55	4	13	10	58	4	1	35	7	5	192	

3. *Eléments autochtones de type méditerranéen :* il convient de classer ici 24 sujets de type méditerranéen ancien, et 27 sujets de type alpino-méditerranéen, soit 51 sujets représentant 26,55% auxquels on doit ajouter les 5,47% représentant l'influence des Méditerranéens chez les hybrides, soit en tout 32,02% de Méditerranéens.

4. *Eléments présentant des affinités cananéennes :* nous devons réunir ici les 32 sujets du sous-groupe asiatique du groupe AC, les 17 sujets du sous-groupe (ABC)-AC, et 3 Alpinoïdes, soit 52 sujets représentant 27,1% auxquels on ajoutera 0,26% représentant l'influence des Alpinoïdes chez les hybrides, donc au total 27,36%.

La répartition de l'indice céphalique s'établit comme suit :

Dolichocéphales, 110 sujets, soit 57,9% de la population;
Mésocéphales, 76 sujets, soit 39,6% de la population;
Brachycéphales, 6 sujets, soit 3,12% de la population.

Si l'on compare aux résultats obtenus pour la population de Médinet el-Fayoum, on voit que le groupe des Brachycéphales est très faible dans les deux séries, et que l'importance des Dolichocéphales est sensiblement plus importante dans les petits bourgs, dont la population se trouverait présenter des affinités littorales plus grandes que celle du chef-lieu.

La comparaison des caractères propres au chef-lieu et aux bourgades sera facilitée en rassemblant les résultats dans un tableau :

	Médinet el-Fayoum	Sennouris Shak-Shuk	District occidental
Autochtones non négroïdes	16,87 %	13,53 %	45,2 %
Autochtones plus ou moins négroïdes .	27,74 %	21,62 %	9,98 %
Méditerranéens	30,66 %	32,02 %	11,9 %
Cananéens	24,71 %	27,36 %	24,95 %

On note que c'est dans le chef-lieu que les éléments strictement autochtones, sans ou avec caractères négroïdes, sont les plus nombreux; en revanche, les Méditerranéens et les Cananéens sont plus nombreux dans les bourgades. Nous avions aussi enregistré de ces anomalies apparentes dans le district occidental [1]; nous les avions expliquées par l'immixion d'éléments caravaniers, représentés surtout par des Sud-orientaux, des Syro-cananéens et des Nord-syriens, plus nombreux dans les villages où ils établissent normalement leurs relais que dans les villes : il en est de même dans la région du Fayoum. Ici la plus grande proportion d'éléments méditerranéens par rapport à la côte, peut être expliquée par l'attrait économique du Fayoum pour les populations du delta — qu'il s'agisse de commerçants ou d'agriculteurs — depuis la plus haute antiquité; le district occidental au contraire était quelque peu délaissé et il a fréquemment été le théâtre d'incursions libyennes qui y ont introduit une plus forte proportion de types aux affinités plus africaines que méditerranéennes : par la suite, ces individus n'émigraient pas vers le delta, et réciproquement les apports de la population méditerranéenne du delta dans le district occidental ont toujours été très faibles. Ces particularités permettent d'expliquer la plus forte proportion de Méditerranéens dans le Fayoum que dans le district occidental.

II. La population non-autochtone du Fayoum.

Rassemblons dans un tableau (ci-après), l'ensemble de la documentation : il est en effet sans intérêt ici, de faire la distinction entre résidents dans le chef-lieu et résidents dans les bourgades, puisqu'il s'agit dans tous les cas, d'Egyptiens non-originaires du Fayoum.

En considérant les groupes dans leur ensemble, on constate que le groupe ABC, avec 5 sujets, représente 4,13% de la série; son taux est donc très faible. Le groupe AC, avec 29 sujets, représente 23,97% auxquels il convient d'ajouter 3,31% pour les 4 sujets du sous-groupe (ABC)-AC et 1,65% pour l'influence de ce groupe chez les hybrides. Le groupe A, avec 56 sujets, représente 46,26%, soit près de la moitié de la série, et l'on doit ajouter à ce chiffre 5,37% pour l'influence du groupe A chez les hybrides. Les groupes sub-négroïdes ont une importance beaucoup plus faible mais non négligeable : le groupe AB, avec

[1] Robert-P. Charles, *op. cit.*, 1962, pp. 60-61.

	Médinet el Fayoum	Sen-nouris	Shak-Shuk	Total	
ABC. Dolichocéphales	4	—	—	4	3,31 %
Mésocéphale	1	—	—	1	0,82 %
AC, Libyco-berbères ..	8	—	—	8	6,62 %
Africains : Berbéro-telliens ..	2	—	—	2	1,65 %
AC, Sud-orientaux ...	6	3	1	10	8,26 %
Asiatiques : Syro-cananéens ..	5	3	—	8	6,62 %
Syro-arménoïde ..	1	—	—	1	0,82 %
(ABC)-AC. Nord-syriens	3	—	—	3	2,48 %
Cilicien	1	—	—	1	0,82 %
A. Méditerranéens anciens ..	8	3	1	12	9,92 %
Alpino-méditerranéens ..	27	4	—	31	25,61 %
Alpinoïdes............	13	—	—	13	10,73 %
AB. Nord-sahariens	3	3	—	6	4,96 %
Saharien des Oasis	1	—	—	1	0,82 %
BC. Nord-nilotiques	2	—	—	2	1,65 %
Nubien	—	—	1	1	0,82 %
(ABC)-BC. Kamito-nilotiques	2	—	1	3	2,48 %
B. Soudanais	1	—	—	1	0,82 %
Hybrides de A et négroïdes :					
Dolichocéphales ..	3	1	—	4	3,31 %
Mésocéphales	4	—	—	4	3,31 %
Brachycéphale ...	1	—	—	1	0,82 %
Hybrides de A et AC :					
Dolichocéphales ..	1	—	1	2	1,65 %
Brachycéphales ..	1	1	—	2	1,65 %
TOTAL ...	98	18	5	121	

7 sujets, compte pour 5,78%; le groupe BC, avec 3 sujets, pour 2,48%; le sous-groupe (ABC)-BC également pour 2,48% et le groupe B avec un seul sujet pour 0,82%; on doit enfin tenir compte de l'influence des sub-négroïdes chez les hybrides, se chiffrant par 3,72%.
B avec un seul sujet pour 0,82%; on doit enfin tenir compte de l'influence des sub-négroïdes chez les hybrides, se chiffrant par 3,72%.

Le regroupement des sujets d'après les affinités géographiques donne les indications suivantes :

1. *Eléments autochtones de type africain sans caractères négroïdes :* les 5 sujets du groupe ABC et les 10 sujets du sous-groupe africain du groupe AC constituent un ensemble de 15 sujets représentant 12,4% de cette série.

2. *Eléments autochtones de type africain présentant des caractères négroïdes plus ou moins accusés* : nous devons classer ici 7 sujets du groupe AB, 3 sujets du groupe BC, 3 sujets du sous-groupe (ABC)-BC et 1 sujet du groupe B, soit 14 sujets représentant 11,58% auxquels on doit ajouter 3,72% pour l'influence des sub-négroïdes chez les hybrides; la proportion totale des sub-négroïdes est donc de 15,50%.

3. *Eléments autochtones de type méditerranéen :* les 12 Méditerranéens anciens et les 31 Alpino-méditerranéens constituent un ensemble de 43 sujets représentant 35,43%; on doit ajouter 4,14% pour l'influence de ces types chez les hybrides, ce qui fait en tout 39,57% de Méditerranéens.

4. *Eléments présentant des affinités cananéennes :* il faut réunir ici, 19 sujets du sous-groupe asiatique de groupe AC, 4 sujets du sous-groupe (ABC)-AC et 13 Alpinoïdes, soit 36 sujets représentant 29,75% auxquels on doit ajouter 1,24% pour l'influence du type alpinoïde chez les hybrides, ce qui donne une proportion de 30,99% de Cananéens.

La proportion de Méditerranéens et de Cananéens est donc sensiblement plus forte chez les Egyptiens récemment installés dans le Fayoum, que chez ceux qui en sont originaires depuis au moins deux générations. Ceci met en évidence la participation importante du delta au peuplement actuel du Fayoum.

L'étude de la répartition de l'indice céphalique met en évidence les particularités suivantes :

Dolichocéphales,	47	sujets, soit 38,83% de la population ;
Mésocéphales,	54	sujets, soit 44,6 % de la population ;
Brachycéphales,	20	sujets, soit 16,57% de la population.

La proportion de Mésocéphales, et surtout de Brachycéphales, est nettement plus importante que dans la population autochtone. Ceci indique qu'une assez grande proportion des Egyptiens récemment installés dans le Fayoum sont originaires du Levant (Libanais et Arméniens).

III. La population de Kuta.

En raison du qualificatif de bédouin, donné à cette population [1], il est sans intérêt de sélectionner les sujets strictement natifs du district et ceux qui y sont installés depuis peu. Nous rassemblons donc en un seul tableau (ci-contre) l'ensemble de la documentation.

En considérant les groupes dans leur ensemble, on voit que sur une série de 187 sujets, le groupe ABC, avec 19 sujets représente 10,15% de la population; le groupe AC, avec 33 sujets, compte pour 17,63%, auxquels il convient d'ajouter 1,6% pour les trois sujets du sous-groupe (ABC)-AC; le groupe A, avec 32 sujets, compte pour 17,2%, auxquels on doit ajouter 4,80% pour la participation de ce groupe aux hybrides. Les éléments sub-négroïdes sont variés et nombreux : le groupe AB, avec 19 sujets, représente 10,15%; le groupe BC, avec 41 sujets, compte pour 21,9%, auxquels on doit ajouter 6,95% pour les 13 sujets du sous-groupe (ABC)-BC; le groupe B représente 4,28% avec 8 sujets, et le sous-groupe (ABC)-B 0,53% avec un seul sujet; enfin les sub-négroïdes se manifestent pour 4,8% par les hybrides. En sélectionnant les sujets d'après leurs affinités géographiques, on arrive à la répartition suivante :

1. *Eléments autochtones de type africain sans caractères négroïdes :* nous devons réunir ici les 19 sujets du groupe ABC et les 9 sujets du sous-groupe africain du groupe AC, soit au total 28 sujets représentant 14,96% de la population de Kuta.

2. *Eléments autochtones de type africain présentant des caractères négroïdes plus ou moins accusés :* nous devons grouper ici les 19 sujets du groupe AB, les 41 sujets du groupe BC, les 13 sujets du sous-groupe (ABC)-BC, les 8 sujets du groupe B et le sujet du sous-groupe (ABC)-B, soit 82 sujets représentant 43,8%, auxquels on doit ajouter 4,8% pour l'influence des sub-négroïdes chez les hybrides, ce qui au total donne 48,6% de sub-négroïdes dans la population de Kuta.

[1] *Second Arab.-Pol. Anthrop. Exp., op. cit.*, 1965, p. 3.

	Autochtones						Non autochtones		Total	
	hommes			femmes			hommes			
	Ad.	20/18	17/14	Ad.	20/18	17/14	Ad.	20/18		
ABC. Dolichocéphales	11	—	—	2	—	—	5	—	18	9,62 %
Mésocéphale	1	—	—	—	—	—	—	—	1	0,53 %
AC, Africains : Kamitiques	6	—	—	1	—	—	2	—	9	4,81 %
AC, Sud-orientaux	6	1	1	8	—	—	3	—	19	10,15 %
Asiatiques : Syro-cananéens	2	—	1	2	—	—	—	—	5	2,67 %
(ABC)-AC. Nord-syriens	—	—	—	—	—	—	3	—	3	1,6 %
A. Méditerranéens anciens	10	1	1	5	3	1	5	—	26	13,9 %
Alpino-méditerranéens	2	—	—	2	—	—	1	—	5	2,67 %
Alpinoïdes	—	—	—	1	—	—	—	—	1	0,53 %
AB. Nord-sahariens	10	—	—	3	—	—	4	—	17	9,09 %
Sahariens	1	—	—	—	—	—	1	—	2	1,06 %
BC. Nord-nilotiques	25	2	—	1	—	—	7	—	35	18,7 %
Nubiens	3	—	—	—	—	—	2	—	5	2,67 %
Nubien des Oasis	1	—	—	—	—	—	—	—	1	0,53 %
(ABC)-BC. Kamito-nilotiques	9	—	—	1	—	—	2	—	12	6,42 %
Kamito-nubien	—	—	—	—	—	—	1	—	1	0,53 %
B. Soudanais	3	—	—	1	—	—	4	—	8	4,28 %
(ABC)-B. Kamito-soudanais	1	—	—	—	—	—	—	—	1	0,53 %
Hybrides de A et négroïdes :										
Dolichocéphales	5	1	1	1	—	—	5	2	15	8,02 %
Mésocéphales	1	—	—	—	—	—	1	—	2	1,06 %
Brachycéphale	—	—	1	—	—	—	—	—	1	0,53 %
TOTAL...	97	5	5	28	3	1	46	2	187	

3. *Eléments autochtones de type méditerranéen :* il convient de classer ici 26 Méditerranéens anciens et 5 Alpino-méditerranéens, soit 31 sujets représentant 16,58% auxquels on doit ajouter 4,54% pour la participation de ces types aux hybrides, ce qui donne au total 21,12% de Méditerranéens dans la population de Kuta.

4. *Eléments présentant des affinités cananéennes :* nous devons réunir ici 24 sujets du sous-groupe asiatique du groupe AC, 3 sujets du sous-groupe (ABC)-AC, et 1 Alpinoïde, soit 28 sujets représentant 14,96% auxquels il faut ajouter 0,27% pour la participation du type alpinoïde aux hybrides, ce qui donne au total 15,23% de Cananéens dans la population de Kuta.

On voit donc que la composition de la population de Kuta est très différente de celle du Fayoum par sa proportion considérablement plus élevée de sub-négroïdes, compensée par une proportion beaucoup plus faible de Méditerranéens et de Cananéens. Nous avions précédemment montré que l'oasis de Siwah était un jalon caravanier entre le delta du Nil, les oasis du sud de la Cyrénaïque et l'Afrique Noire[1]; il apparaît d'après cette nouvelle enquête que la région de Kuta, à la limite occidentale de l'oasis du Fayoum, est un jalon caravanier entre ce dernier district, les oasis du sud de la Cynéraïque et l'Afrique Noire.

L'étude de la répartition de l'indice céphalique met en évidence les particularités suivantes :

Dolichocéphales,	163 sujets, soit 87,2%	de la population ;
Mésocéphales,	21 sujets, soit 11,2%	de la population ;
Brachycéphales,	3 sujets, soit 1,6%	de la population.

Les proportions ainsi enregistrées, sont de l'ordre de ce qui avait été noté pour l'oasis de Siwah[2], ce qui accentue le parallélisme d'origine des deux populations.

[1] Robert-P. Charles, *op. cit.,* 1962, pp. 58-61 ; et Robert-P. Charles, Recherches sur l'origine du peuplement de la Cyrénaïque, *Bull. Soc. de Géogr. d'Egypte,* t. XXXVII, 1965, pp. 124-125.
[2] *Op. cit.,* 1962, p. 60.

IV. La population autochtone de l'oasis de Beheira.

	hommes			femmes			Total	
	Ad.	20/18	17/14	Ad.	20/18	17/14		
ABC. Dolichocéphales	9	—	—	—	1	1	11	5,22 %
Mésocéphales	2	1	—	1	—	—	4	2,11 %
AC, Kamitiques	2	—	—	2	1	—	5	2,64 %
Africains : Libyco-berbères	8	—	—	2	5	2	17	9 %
Berbéro-tellien	1	—	—	—	—	—	1	0,53 %
AC, Sud-orientaux	4	—	—	7	6	5	22	11,64 %
Asiatiques : Syro-cananéens	4	—	—	2	8	3	17	9 %
Syro-arménoïde	—	—	—	—	1	—	1	0,53 %
(ABC)-AC. Nord-syriens	2	—	—	2	6	3	13	6,87 %
Ciliciens	—	—	1	2	1	2	6	3,17 %
A. Méditerranéens anciens	2	—	—	1	4	3	10	5,29 %
Alpino-méditerranéens	2	1	—	3	5	4	15	7,94 %
Alpinoïdes	—	—	—	—	3	—	3	1,58 %
AB. Nord-sahariens	3	—	—	2	—	—	5	2,64 %
Saharien	1	—	—	—	—	—	1	0,53 %
Saharien des Oasis	—	—	—	—	—	1	1	0,53 %
BC. Nord-nilotiques	12	1	—	5	1	4	23	7,74 %
Nubiens	3	—	—	—	—	2	5	2,64 %
(ABC)-BC. Kamito-nilotiques	—	—	—	1	2	2	5	2,64 %
Kamito-nubiens	—	—	—	—	2	—	2	1,06 %
Kam. nub. des Oasis	1	—	—	—	—	—	1	0,53 %
B. Soudanais	1	—	—	1	—	—	2	1,06 %
Hybrides de A et négroïdes :								
Dolichocéphales	1	—	1	1	2	2	7	3,71 %
Mésocéphales	—	1	—	—	3	1	5	2,64 %
Hybrides de A et AC :								
Dolichocéphales	—	—	—	4	—	—	4	2,11 %
Mésocéphales	—	—	—	2	—	—	2	1,06 %
Brachycéphale	—	—	—	—	—	1	1	0,53 %
Total	58	4	2	38	51	36	189	

Sur une série de 189 sujets, le groupe ABC, avec 15 sujets, représente 7,94% de la population ; le groupe AC, avec 63 sujets, compte pour 33,33%, auxquels on doit ajouter 9,52% pour les 18 sujets du sous-groupe (ABC)-AC et 1,85% pour l'influence du groupe AC chez les hybrides, ce qui donne au total 44,70% ; le groupe A, avec 28 sujets, représente 14,82%, auxquels on doit ajouter 5,03% pour l'influence de ce groupe chez les hybrides, soit au total 19,85%. Le groupe AB, avec 7 sujets, compte pour 3,71% ; le groupe BC, avec 28 sujets, compte pour 14,82%, auxquels il convient d'ajouter 4,24% pour les 8 sujets du sous-groupe (ABC)-BC, et le groupe B, avec 2 sujets, ne compte que pour 1,06% ; enfin, il faut mentionner que les groupes sub-négroïdes dans leur ensemble, interviennent pour 3,18% chez les hybrides.

En sélectionnant les sujets, d'après leurs affinités géographiques, on arrive à la répartition suivante :

1. *Eléments autochtones de type africain sans caractères négroïdes :* nous devons grouper ici les 15 sujets du groupe ABC et les 23 sujets du sous-groupe africain du groupe AC, soit au total 38 sujets représentant 20,10% de la population autochtone de Beheira.

2. *Eléments autochtones de type africain présentant des caractères négroïdes plus ou moins accusés :* il convient de réunir ici les 7 sujets du groupe AB, les 28 sujets du groupe BC, les 8 sujets du sous-groupe (ABC)-BC et les 2 sujets du groupe B, soit au total 45 sujets représentant 23,80%, auxquels il faut ajouter 3,18% pour l'influence des sub-négroïdes chez les hybrides. En fin d'analyse, les sub-négroïdes interviennent pour 26,98% dans la composition de la population.

3. *Eléments autochtones de type méditerranéen :* il convient de classer ici 10 Méditerranéens anciens et 15 Alpino-méditerranéens, soit 25 sujets représentant 13,47%, auxquels il faut ajouter 4,75% pour la participation de ces types aux hybrides, ce qui au total, donne une proportion de 18,32% de Méditerranéens.

4. *Eléments présentant des affinités cananéennes :* nous devons réunir ici les 40 sujets du sous-groupe asiatique du groupe AC, les 19 sujets du sous-groupe (ABC)-AC et les 3 Alpinoïdes, soit 62 sujets représentant 32,8%, auxquels s'ajoute 0,27% pour l'influence du type alpinoïde chez les hybrides, soit au total 33,07% de la population.

L'étude de la répartition de l'indice céphalique met en évidence les particularités suivantes :

Dolichocéphales,	107	sujets, soit 56,6% de la population ;
Mésocéphales,	74	sujets, soit 39,17% de la population ;
Brachycéphales,	8	sujets, soit 4,23% de la population.

Cette proportion est très voisine de celle que nous avons notée dans la population des bourgades du Fayoum ; en revanche la proportion des différents éléments s'en sépare notablement par la présence à Beheira, d'un plus grand nombre d'Africains, négroïdes ou non, et de Cananéens, alors que les Méditerranéens sont sensiblement moins nombreux. Ces différences s'expliquent par les conditions géographiques : en effet, la forte proportion de sub-négroïdes est surtout due à la présence d'un grand nombre de Nord-nilotiques et de Nubiens, celle des Cananéens est due à la présence d'un grand nombre d'Arabes (Sud-orientaux et Syro-cananéens) présentant plus d'affinités avec les habitants de la péninsule arabique qu'avec ceux de la Mésopotamie.

Le peuplement de l'oasis de Beheira ne semble donc pas s'être fait uniquement par une migration passant par la Basse-Egypte, comme cela était le cas pour le Fayoum, ou avec une participation du sud de la Cyrénaïque et de l'Afrique Noire, comme c'était le cas pour l'oasis de Siwah et la population de Kuta, mais avec une participation des populations nilotiques et arabes, venant de l'Est et du Sud-Est en passant par la Haute-Egypte.

V. La population non-autochtone de l'oasis de Beheira

Sur une série de 61 sujets, le groupe ABC, avec 10 sujets, compte pour 16,4% ; le groupe AC, avec 16 sujets, pour 26,24%, chiffre auquel on peut adjoindre 6,56% pour les 4 sujets du sous-groupe (ABC)-AC ; le groupe A, avec 7 sujets, représente 11,48% auxquels on doit ajouter 5,74% pour la participation de ce groupe aux hybrides ;

	hommes		femmes			Total	
	Ad.	$^{20}/_{18}$	Ad.	$^{20}/_{18}$	$^{17}/_{14}$		
ABC. Dolichocéphales	4	—	—	1	—	5	8,2 %
Mésocéphales	5	—	—	—	—	5	8,2 %
AC, Kamitiques	3	—	—	—	—	3	4,92 %
Africains : Libyco-berbères	3	—	—	—	—	3	4,92 %
Berbéro-tellien	1	—	—	—	—	1	1,64 %
AC, Sud-orientaux	1	1	—	2	1	5	8,2 %
Asiatiques : Syro-cananéens	1	—	1	1	1	4	6,56 %
(ABC)-AC. Nord-syriens	2	—	—	1	—	3	4,92 %
Cilicien	—	—	1	—	—	1	1,64 %
A. Méditerranéens anciens	—	—	—	1	1	2	3,28 %
Alpino-méditerranéens	1	—	1	2	—	4	6,56 %
Alpinoïde	—	—	—	1	—	1	1,64 %
AB. Nord-sahariens	2	—	—	1	1	4	6,56 %
Sahariens	2	—	—	—	—	2	3,28 %
BC. Nord-nilotiques	4	—	1	—	1	6	9,84 %
Nubiens.................	1	—	1	—	—	2	3,28 %
(ABC)-BC. Kamito-nilotiques	—	—	1	1	—	2	3,28 %
Hybrides de A et négroïdes :							
Dolichocéphales	1	—	1	1	2	5	8,2 %
Mésocéphales	1	—	—	1	—	2	3,28 %
TOTAL ...	33	1	7	13	7	61	

le groupe AB, avec 6 sujets, compte pour 9,84 %, le groupe BC, avec 8 sujets pour 13,12%, auxquels s'ajoutent 3,28% pour les sujets du sous-groupe (ABC)-BC, et le sous groupe (ABC)-B avec un seul sujet ne compte que pour 1,64% ; enfin, l'influence des sub-négroïdes en général chez les hybrides, se manifeste par 5,74%.

En sélectionnant les sujets d'après leurs affinités géographiques, on arrive à la répartition suivante :

1. *Eléments autochtones de type africain sans caractères négroïdes :* nous devons grouper ici les 10 sujets du groupe ABC et les 7 sujets du sous-groupe africain du groupe AC, soit au total 17 sujets représentant 27,88% de cette série.

2. *Eléments autochtones de type africain présentant des caractères négroïdes plus ou moins accusés :* il convient de réunir ici les 6 sujets du groupe AB, les 8 sujets du groupe BC, les 2 sujets du sous-groupe (ABC)-BC et le sujet du sous-groupe (ABC)-B, soit 17 sujets comptant pour 27,84% auxquels on doit ajouter 5,74% pour l'influence des sub-négroïdes chez les hybrides; en fin d'analyse, nous trouvons une proportion de 33,58% de sub-négroïdes dans cette série.

3. *Eléments autochtones de type méditerranéen :* il convient de classer ici 2 Méditerranéens anciens et 4 Alpino-méditerranéens, soit 6 sujets comptant pour 9,84% auxquels on doit ajouter 5,74% pour l'influence de ces types chez les hybrides, ce qui donne au total 15,58% de Méditerranéens dans cette série.

4. *Eléments présentant des affinités cananéennes :* nous devons réunir ici les 9 sujets du sous-groupe asiatique du groupe AC, les 4 sujets du sous-groupe (ABC)-AC et un Alpinoïde, soit 14 sujets représentant 22,96% de la série.

L'étude de la répartition de l'indice céphalique met en évidence les particularités suivantes :

Dolichocéphales,	36	sujets, soit 59 % de la série ;
Mésocéphales,	23	sujets, soit 38,72% de la série ;
Brachycéphales,	2	sujets, soit 3,28% de la série.

Cette proportion est presque identique à celle trouvée pour la population autochtone de Beheira ; en revanche la proportion des différents éléments en diffère par une plus grande quantité d'Africains, négroïdes ou non, alors que les Méditerranéens et les Cananéens sont moins nombreux. Ces différences mettent en évidence une migration récente d'habitants de la Haute-Egypte vers l'oasis de Beheira, et confirme donc l'impression tirée de l'étude de la population autochtone de cette oasis.

Conclusions sur l'enquête anthropologique dans le Fayoum et l'oasis de Beheira

Après avoir étudié séparément, chacune des communautés ayant fait l'objet de cette enquête, il convient de procéder à certains regroupements

afin de mieux mettre en évidence les caractères propres à chacune de ces grandes séries. Dans le tableau ci-contre, nous donnons la répartition générale des types.

Un second tableau (p. 119), donnant la répartition, non plus de chaque type en détail, mais des groupes structuraux dans leur ensemble [1], sera encore plus explicite.

On voit que le groupe A est prédominant au Fayoum, surtout chez les non-autochtones ; les groupes A et BC ont une importance identique chez les bédouins de Kuta ; en revanche dans l'oasis de Beheira, c'est le groupe AC qui prédomine et le groupe A n'occupe que la seconde place. Les groupes et sous-groupes AB, BC, (ABC)-BC, B et (ABC)-B tiennent partout une place non négligeable, mais leur proportion n'est vraiment importante que chez les bédouins de Kuta, et elle est aussi, relativement importante, dans l'oasis de Beheira.

En groupant les types, non plus systématiquement, mais d'après leurs affinités géographiques, on peut dresser le tableau suivant :

	Région du Fayoum		Kuta (bédouins)	Oasis de Beheira		Total
	autocht.	non-autocht.		autocht.	non-autocht.	
	%	%	%	%	%	%
Eléments non-négroïdes.....	15,45	12,4	14,96	20,10	27,88	16,6
Eléments sub-négroïdes	24,83	15,50	48,60	26,98	33,58	29,18
Eléments méditerranéens ...	31,20	39,57	21,12	18,22	15,58	26,94
Eléments cananéens........	27,30	30,99	15,23	33,07	22,96	26,48

Les éléments méditerranéens sont prédominants au Fayoum avec une proportion de l'ordre du tiers de la population, taux légèrement dépassé

[1] Le nombre fractionnaire de sujets dans certains groupes provient de la répartition des hybrides dans les groupes constitutifs.

	Médinet el-Fayoum (autochtones)		Bourgades du Fayoum (autochtones)		Fayoum (non-autochtones)		Bédouins de Kuta		Beheira (autochtones)		Beheira (non-autochtones)		Total	
		%		%		%		%		%		%		%
ABC. Dolichocéphales	18	6,89	7	3,64	4	3,31	18	9,62	11	5,82	5	8,2	63	5,93
Mésocéphales	9	3,45	3	1,56	1	0,82	1	0,53	4	2,11	5	8,2	23	2,27
AC. Kamitiques........	4	1,53	6	3,12	—	—	9	4,81	5	2,64	3	4,92	27	2,67
Africains : Libyco-berbères....	10	3,81	9	4,69	8	6,62	—	—	17	9	3	4,92	47	4,65
Berbéro-telliens ...	3	1,11	1	0,52	2	1,65	—	—	1	0,53	1	1,64	8	7,91
AC. Sud-orientaux	17	6,51	23	11,98	10	8,26	19	10,15	22	11,64	5	8,2	96	9,49
Asiatiques : Syro-cananéens	19	7,28	18	9,38	8	6,62	5	2,67	17	9	4	6,56	71	7,02
Syro-arménoïdes ...	1	0,38	1	0,52	1	0,82	—	—	1	0,53	—	—	4	0,39
(ABC)-AC. Nord-syriens	16	6,13	13	6,77	3	2,48	3	1,6	13	6,87	3	4,92	51	5,04
Ciliciens	—	—	4	2,08	1	0,82	—	—	6	3,17	1	1,64	12	1,18
Arménoïde	1	0,38	—	—	—	—	—	—	—	—	—	—	—	—
A. Méditerranéens anciens ...	22	8,42	24	12,5	12	9,92	26	13,9	10	5,29	2	3,28	96	9,49
Alpino-méditerranéens	48	18,4	27	14,05	31	25,61	5	2,67	15	7,94	4	6,56	130	12,85
Alpinoïdes	10	3,81	3	1,56	13	10,73	1	0,53	3	1,58	1	1,64	31	3,06
AB. Nord-sahariens	12	4,59	3	1,56	6	4,96	17	9,09	5	2,64	4	6,56	47	4,65
Sahariens	7	2,68	4	2,08	—	—	2	1,06	1	0,53	2	3,28	16	1,58
Sahariens des Oasis	—	—	—	—	1	0,82	—	—	1	0,53	—	—	2	0,19
BC. Nord-nilotiques	22	8,42	12	6,25	2	1,65	35	18,7	23	12,18	6	9,84	100	9,89
Nubiens	9	3,45	2	1,04	1	0,82	5	2,67	5	2,64	2	3,28	24	2,37
Nubien des Oasis	—	—	—	—	—	—	1	0,53	—	—	—	—	1	0,09
(ABC)-BC. Kamito-nilotiques ..	7	2,68	7	3,64	3	2,48	12	6,42	5	2,64	2	3,28	36	3,56
Kamito-nubiens	1	0,38	—	—	—	—	1	0,53	2	1,06	—	—	4	0,39
Kam.nub. des Oasis.	—	—	—	—	—	—	—	—	1	0,53	—	—	1	0,09
B. Soudanais	2	0,76	3	1,56	1	0,82	8	84,28	2	1,06	—	—	16	1,58
(ABC)-B. Kamito-soudanais ..	2	0,76	—	—	—	—	1	0,53	—	—	1	1,64	4	0,39
Hybrides de A et négroïdes :														
Dolichocéphales ...	13	4,98	12	6,25	4	3,31	15	8,02	7	3,71	5	8,2	56	5,54
Mésocéphales	7	2,68	9	4,69	4	3,31	2	1,06	5	2,64	2	3,28	29	2,86
Brachycéphales	1	0,38	—	—	1	0,82	1	0,53	—	—	—	—	3	0,29
Hybrides de A et AC :														
Dolichocéphales ...	—	—	—	—	2	1,65	—	—	4	2,11	—	—	6	0,59
Mésocéphales	—	—	—	—	—	—	—	—	2	1,06	—	—	2	0,19
Brachycéphales	—	—	1	0,52	2	1,65	—	—	1	0,53	—	—	4	0,39
TOTAL ...	261		192		121		187		189		61		1011	

	Région du Fayoum				Kuta (bédouins)		Oasis de Beheira				Total	
	autochtones		non-autocht.				autochtones		non-autocht.			
		%		%		%		%		%		%
Groupe ABC	37	8,16	5	4,13	19	10,15	15	7,94	10	16,4	80	7,91
Groupe AC	112 ½	24,81	31	25,62	33	17,63	66 ½	35,18	16	26,24	259	25,6
s/gr. (ABC)-AC	34	7,5	4	3,31	3	1,6	18	9,52	4	6,56	63	6,22
Groupe A	155 ½	34,3	62 ½	51,67	41	21,9	37 ½	19,85	10 ½	17,22	307	30,36
Groupe AB	26	5,74	7	5,78	19	10,15	7	3,71	6	9,84	65	6,42
Groupe BC	44	9,71	3	2,48	41	21,90	28	14,82	8	13,12	124	12,25
s/gr. (ABC)-BC	15	3,31	3	2,48	13	6,95	8	4,24	2	3,28	41	4,05
Groupe B	5	1,10	1	0,82	8	4,28	2	1,06	—	—	16	1,58
s/gr. (ABC)-B	2	0,44	—	—	1	0,53	—	—	1	1,64	4	0,39
Négroïdes ind.	21	4,63	2 ½	3,72	9	4,8	6	3,18	3 ½	5,74	42	4,15
TOTAL ...	453		121		187		189		61		1011	

chez les non-autochtones ; ces éléments sont beaucoup moins nombreux chez les bédouins de Kuta et dans l'oasis de Béheira, où ce sont les éléments sub-négroïdes qui sont prédominants, surtout à Kuta où ils constituent près de la moitié de la population. Les éléments orientaux, arabes au sens large, sont nombreux partout, sauf à Kuta où les Bédouins présentent nettement des affinités libyennes.

La composition des populations qualifiées de non-autochtones, nous renseigne sur les mouvements démographiques récents : on voit ainsi que la population du Fayoum s'accroît avec l'arrivée d'éléments originaires du delta (méditerranéens et cananéens prédominants) alors que celle de Beheira s'accroît avec l'arrivée d'éléments originaires de Haute-Egypte (nilotiques et arabes prédominants).

Enfin, il convient d'examiner la répartition des classes de l'indice céphalique :

	Région du Fayoum		Kuta	Oasis de Beheira		Total
	autocht.	non-autocht.		autocht.	non-autocht.	
	%	%	%	%	%	%
Dolichocéphales	54	38,83	87,2	56,6	59,0	59,2
Mésocéphales	41	44,6	11,2	39,17	38,72	35,4
Brachycéphales	5	16,57	1,6	4,23	3,28	5,4

On voit que la proportion des Brachycéphales est partout très faible sauf chez les habitants non-autochtones du Fayoum, parmi lesquels nous avons décelé un nombre appréciable de Levantins. Partout ailleurs, les Dolichocéphales l'emportent largement, ainsi qu'il est de règle en Afrique méditerranéenne ; la proportion la plus forte est chez les bédouins de Kuta, chez lesquels l'influence de l'Afrique Noire est la plus notable.

CONCLUSIONS GÉNÉRALES

L'analyse du matériel publié par la mission égypto-polonaise à la suite de la deuxième enquête anthropologique, nous a permis d'établir les points suivants :

1. Le peuplement moderne du Fayoum est en relation avec celui de la Basse-Egypte, constitué indépendamment de celui du district occidental et de celui de la Haute-Egypte.

2. L'étude des habitants non-autochtones du Fayoum montre que la migration de sujets venant du delta, et souvent d'origine levantine, se poursuit encore actuellement.

3. Les Bédouins de Kuta sont originaires du Sud de la Libye et renferment une forte proportion de sub-négroïdes.

4. Le peuplement de l'oasis de Beheira est en relation avec le peuplement ancien du Fayoum et il continue de s'accroître avec l'immigration d'habitants, arabes et nilotiques, originaires de la Haute-Egypte.

Les résultats de la présente enquête se révèle donc très importante en mettant en évidence les caractères propres à chaque région naturelle de la partie occidentale de l'Egypte.

OBSERVATIONS ON THE FLORA OF THE SINAI MOUNTAIN REGION

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The exploration of the flora of Sinai started during the 17th century or even earlier. An account of the more important contributions, published on the Sinai flora is given by Täckholm (1932, p. 194-196) and by Zohary (1935, p. 557-560).

Most of this literature, which will not be repeated here, dealt with the mountain part of Sinai. Studies on the North and Central parts of the peninsula are few, especially as concerned with the Tih desert. Most important are the contributions of Range (1921) and Boulos (1960).

Ecologically there are only a few contributions. Zohary in addition to the paper quoted above, published a short work on Sinai (1944), and Migahid et al. (1959) made a study including soil analyses of the western and southern parts of Sinai.

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The author has had occasion to visit the Sinai mountains twice. In May 1956 he joined an expedition arranged by Cairo University, and in April 1961 one arranged by Assiut University. During these two visits 298 species belonging to 53 families were collected. Nearly the same number of species was found each time, 206 species during the first visit and 191 during the second.

The first visit took place after an exceptionally rainy season, hence a very rich vegetation at that occasion. Afterwards followed five years with practically no rain, and when the same area was visited again in 1961, the vegetation was extremely poor.

99 species were collected during both visits, actually common plants or perennials occupying a permanent position in the region. The remaining 107 species collected during the first trip were mainly annuals or rare plants that only flourish after a rainfall; obviously these were not found again during the second journey. On the other hand, the second trip gave another 92 species found in areas with permanent irrigation, thus independent of rainfall, such as Feiran Oasis and Rabbah garden, or in areas not explored during the first journey (see maps 1 and 2).

During the two visits, 30 species new to Sinai were recorded, of which two are new to Egypt and one new to Science. This shows that in spite of all previous studies, new plants may still be expected. It is therefore most desirable that a detailed investigation of the area should be carried out in a near future.

* * *

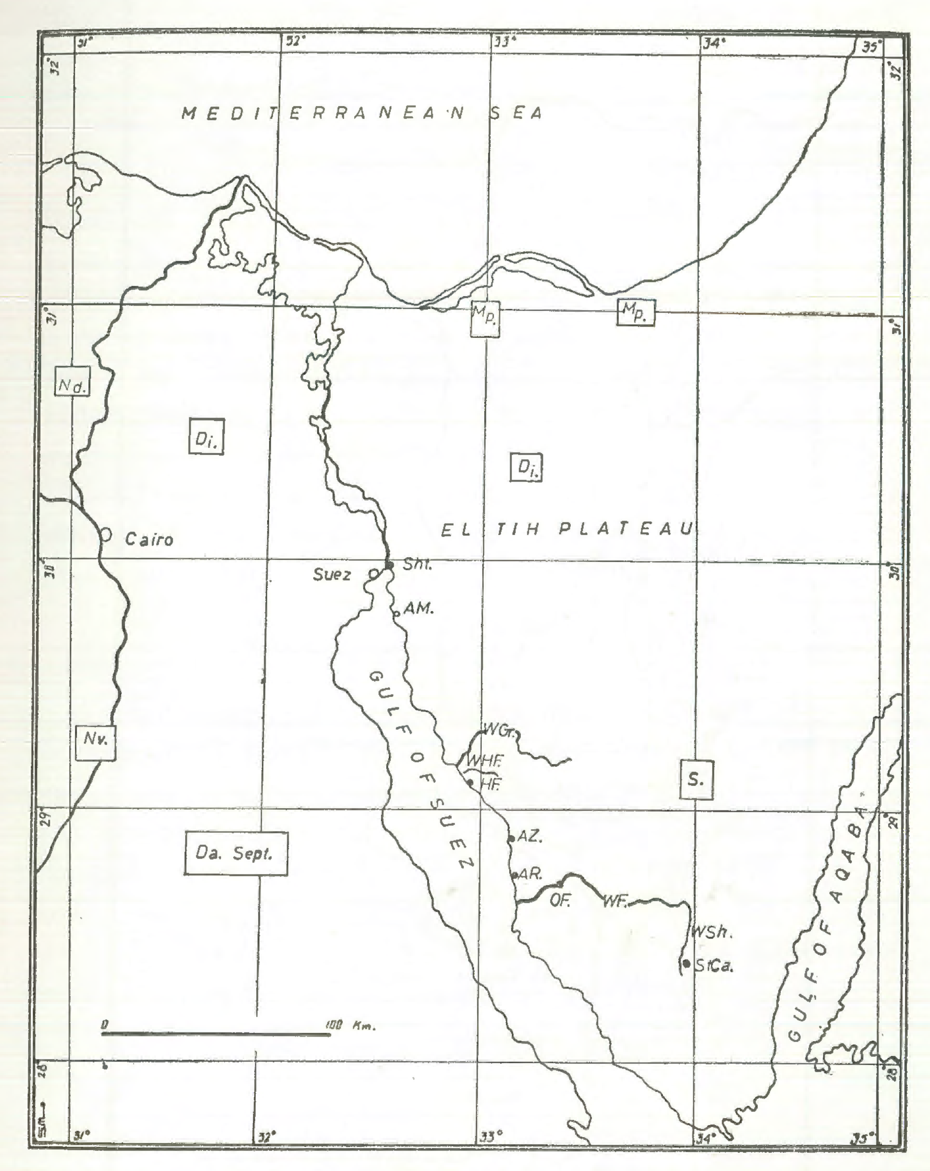
The Sinai peninsula is a more or less triangular area of 61,000 sq. km., occupying the north-eastern corner of Egypt.

Phytogeographically (compare Zohary 1935), the peninsula stands in a middle position between 3 well defined phytogeographical regions, viz. Saharo-Scindian (African-Indian Desert region of Good 1947), Irano-Thuranian (West and Central Asiatic region of Good 1947), and the Mediterranean. Of this reason its flora combines the elements of these three regions.

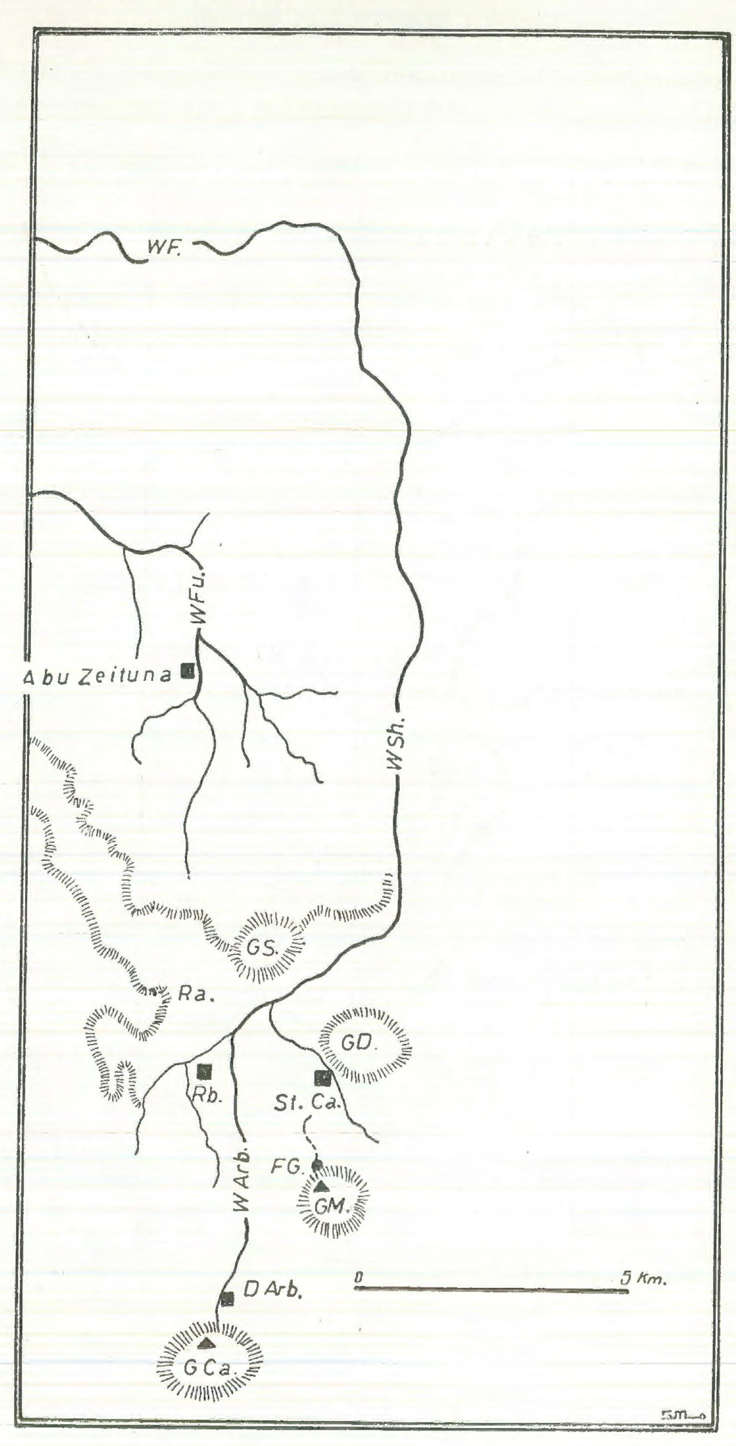
Zohary (1935) gave an account of the floristic composition of the vegetation of the peninsula. He adopted in his treatment the nomenclature introduced by Eig (1931-1932).

He recognized the presence of 942 species, belonging to different elements or groups of connected elements. Most important of these elements are :

a) Saharo-Scindian, represented by 299 species.
b) Irano-Thuranian, represented by 98 species.
c) Mediterranean, represented by 118 species.
d) Sudano-Deccanian, represented by 41 species.



Map 1.



Map 2.

In addition species belonging to biregional connection groups constitute about 40% of the number of species. Important connection groups are :

a) Mediterranean-Irano-Thuranian.
b) Saharo-Scindian-Irano-Thuranian.

There are also enclaves (plants of foreign elements) isolated in certain depressions of Tih plateau or on the high elevations of the southern mountains.

Finally there are about 36 endemic species, of which most are confined to the mountain region and belonging to the Irano-Thuranian element. Only a few endemics belong to the Saharo-Scindian element and are related genetically to the Mediterranean element. These latter species are characteristic to the Isthmic Desert (Di.).

Recent records (see Täckholm et al., 1956) would account for the peninsula a higher number of species. Also in this paper there are several new records which increase the total number.

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As already mentioned, the following account is the result of two visits to the mountain region in south Sinai, in May 1956 and in April 1961. During both visits, the author was accompanying Prof. Dr. Vivi Täckholm, who kindly determined the collections. They are deposited in Cairo (CAI), the material from the first visit, and in Assiut (AST) from the second journey. The author is greatly indebted to Prof. Täckholm for her invaluable help and for the facilities extended to him in the Herbarium Library of the Cairo University.

ABBREVIATIONS

AM	Ayun Musa, collecting date CAI : 10.5.
AR	Abu Rudeis, collecting date AST : 20.4.
AST	The Herbarium of the Botany Department, Assiut University (proposed international abbreviation, it is not yet included in Index Herbariorum).
AZ	Abu Zenima, collecting date CAI : 14.5.
CAI	The Herbarium of the Botany Department of the Faculty of Science, Cairo University (international abbreviation included in Index Herbariorum).
DArb	Deir El Arbain, see map 2 ; collecting dates CAI 12.5 ; AST 23.4.
Da.sept	The Arabic desert east of the Nile, north of Qena-Qusseir road, ending at Wadi Tumilat.
Da.mer	The Arabic desert east of the Nile, south of Qena-Qusseir road, ending at the Sudan border.
FG	Farsh El Gebl, below the summit of Gebl Musa, see map 2 ; collecting dates CAI 11.5 ; AST 22.4.
G	The Herbarium of Geneva (international abbreviation).
GD	Gebl El Deir in front of the entrance of the Catherina Monastery.
GE	Gebl Elba, a mountain group situated in SE Egypt on the border to Sudan.
GM	Gebl Musa, see map 2 ; collecting dates CAI 11.5 ; AST 22.4.
GS	Gebl El Sanaa, see map 2 ; collecting date AST 24.4.
HF	Hammam Faraun, see map 1 ; collecting date CAI 15.5.
OF	Feiran Oasis, see map 1 ; collecting dates CAI 10.5 ; AST 26.4.
Ra	El Raha plain, see map 2 ; collecting date CAI 13.5.
Rb	Rabbah, cultivated ground at the entrance of Wadi El Arbain, see map 2 ; collecting date AST 23.4.
S	Sinai mountain region, see map 1.
Sht	Shatt, see map 1 ; collecting date CAI 15.5.
StCa	Catherine (St. Catherine) Monastery, garden and adjacent ground ; collecting dates CAI 10.5 ; AST 25.4.
WArb	Wadi El Arbain, see map 2 ; collecting dates CAI 12.5 ; AST 23.4.
WF	Wadi Feiran, see map 1 ; collecting dates CAI 10.5 ; AST 21.4.
WFu	Wadi Furieh, see map 2 ; collecting date AST 24.4.
WGr	Wadi Gharandal, see map 1 ; collecting date CAI 14.5.
WHF	Wadi leading to Hammam Faraun ; collecting date CAI 15.5.
WSh	Wadi El Sheikh, see maps 1 and 2.
ç	New record to Sinai.

ENUMERATION OF THE SPECIES COLLECTED

Families, genera and species are arranged alphabetically to facilitate the consulting of the list.

Aizoaceae

Glinus lotoides L. Along ditches in cultivated grounds.
AST : OF.

Amaranthaceae

Aerva persica (Burm. f.) Merrill v. *bovei* (Webb) Chiov. In sandy soil forming hummocks.
AST : WF., WSh., WArb.

Asclepiadaceae

Gomphocarpus sinaicus Boiss. On rocky grounds.
CAI : StCa., GD., WArb., inner end of Ra.
AST : StCa., GD., WArb.

Leptadenia pyrotechnica (Forssk.) Decne. Only one specimen observed, a large bush over man's height.
AST : WF.

Boraginaceae

Alkanna orientalis (L.) Boiss. On rocky grounds ; has strikingly large yellow flowers.
CAI : StCa., GD., DArb.
AST : GD., GM., WArb.

Anchusa aegyptiaca (L.) CD.
CAI : Garden of DArb.

Anchusa milleri Willd.
AST : Rb., WArb.

Asperugo procumbens L. Weed, only known in Egypt from this place, whence it was recorded 40 years ago by A. Kaiser, material in G.
CAI : Garden of DArb.
AST : Rb.
Echium sericeum Vahl.
CAI : WArb.
Gastrocotyle hispida (Forssk.) Bge.
AST : Rb.
Heliotropium arbainense Fres. On rocky grounds; flowers comparatively large, yellow, turning white with age.
CAI : GD.
AST : GD., WFu.
Heliotropium bacciferum Forssk.
AST : WF.
Heliotropium luteum Poir.
CAI : WHF.
Lappula sinaica (DC.) Asch. & Schweinf.
AST : GS., WFu.
Lappula spinocarpos (Forssk.) Asch. Growing in gardens.
CAI : WArb.
Paracaryum intermedium Lipsky v. *boissieri* Schweinf.
CAI : GM. stepway, WArb., DArb. in garden.

CAMPANULACEAE

Campanula dulcis Decne. In Egypt confined to Sinai only.
CAI : StCa. in garden, GM. stepway.

CAPPARACEAE

Capparis cartilaginea Decne. Erect shrub growing on cliffs, filaments white. Fruit of a strong mustard-like taste, eaten by the Bedouins.
CAI : close to AZ.
AST : WF.
Capparis spinosa Jusl. Hanging shrub. growing on cliffs, filaments red.

CAI : near StCa.
AST : GD., WF.
Cleome arabica Jusl. Sticky plant with small brown-red flowers.
CAI : Sht. WArb.
Cleome droserifolia (Forssk.) Del. Prostrate, densely glandular shrublet with small orbicular leaves.
AST : entrance of WF.

CARYOPHYLLACEAE

Arenaria graveolens Schreb. Small delicate plant growing on moist rocky ground. In Egypt confined to Sinai.
CAI : near StCa., GM. stepway.
AST : Bir El Banat at StCa.
Buffonia multiceps Decne. Endemic in Sinai.
CAI : GD.
Dianthus sinaicus Boiss. Endemic in Sinai.
CAI : GD.
Gymnocarpos decandrum Forssk. Woody shrublet with small brown flowers and cylindrical fleshy leaves.
AST : WF.
Gypsophila capillaris (Forssk.) C. Chr. Roots rich in saponin, used for washing.
CAI : DArb., WArb.
Holosteum liniflorum Stev. In Egypt confined to Sinai.
AST : Rb.
Minuartia meyeri Boiss. v. *major* Boiss. Weed in gardens. In Egypt confined to Sinai.
AST : Rb.
Paronychia sinaica Fres.
CAI : mountains of Ra.
Polycarpaea repens (Forssk.) Asch. & Schweinf.
CAI : outside OF.
ç *Polycarpon tetraphyllum* (L.) L. v. *alsinifolium* (Biv.) DC. In moist ground. New record to Sinai.
CAI : WArb.

Robbairea delileana Milne-Redh. v. *major* (Asch. & Schweinf.) Täckh. In sandy places.
CAI : WGr.
Silene conoidea L. Weed in gardens.
AST. Rb.
Silene leucophylla Boiss. Endemic in the Sinai mountains.
CAI : GM. stepway.
Silene linearis Decne.
CAI : Ra.
ç *Silene nocturna* L. Weed. New record to Sinai.
CAI : OF.
Silene schimperiana Boiss. Endemic in the Sinai mountains.
CAI : GM. stepway.
Silene villosa Forssk. In sandy places.
CAI : WGr.
AST : WF.
Spergularia diandra (Guss.) Heldr. & Sart.
AST : Rb., GM.

CHENOPODIACEAE

Anabasis articulata (Forssk.) Moq.-Tand.
AST : Rb., GM.
Arthrocnemon glaucum (Del.) Ung.-Sternb. In moist salty places.
CAI : AZ.
AST : AR.
Atriplex inamoena Aellen.
AST : WF.
Atriplex leucoclada Boiss.
AST : WF.
Bassia muricata (L.) Murr.
CAI : WGr.
Beta vulgaris L. Weed in cultivated ground.
AST : Rb.
Chenopodium murale L. Weed in gardens.
CAI : DArb.

AST : Rb.
Chenopodium vulvaria L.
CAI : WArb.
Cornulaca monacantha Del.
AST : WF.
Halopeplis perfoliata (Forssk.) Bge ex Schweinf. In maritime salty places.
CAI : AZ.
Haloxylon articulatum (Cav.) Bge.
AST : AR.
Haloxylon salicornicum (Moq.-Tand.) Boiss.
CAI : entrance of WF., HF.
AST : entrance of WF.
Salsola tetrandra Forssk.
CAI : HF.
Salsola vermiculata L. In moist salty places.
CAI : HF.
Suaeda monoica Forssk.
AST : AR.
Suaeda vermiculata L. In moist salty places.
CAI : HF.

CISTACEAE

Helianthemum kahiricum Del.
AST : WFu.
Helianthemum lippii (L.) Dum.-Cours.
CAI : GM. stepway, end and beginning of Ra., StCa., GD.
AST : WFu.
ç *Helianthemum sessiliflorum* (Desf.) Pers. New record to Egypt.
CAI : GM. stepway.

COMPOSITAE

Achillea fragrantissima (Forssk.) Sch. Bip. Strong-scented shrublet.
AST : WFu.

Anthemis cairica Vis. Weed in gardens.
AST : Rb., DArb.
Artemisia herba-alba Asso v. *laxiflora* Boiss. Strong-scented, growing on high altitudes.
CAI : GD.
AST : GM.
Artemisia judaica L. Strong-scented.
AST : WF., Ra., WFu.
Atractylis flava Desf.
AST : WFu.
Carduus getulus Pomel. Weed in cultivated ground.
CAI : garden of DArb., WArb., OF.
AST : Rb.
Centaurea eryngioides Lam.
CAI : WArb.
AST : WFu.
Chrysanthemum coronarium L. Weed in cultivated ground.
CAI : OF.
Conyza linifolia (Willd.) Täckh. Weed in gardens and on canal banks.
AST : OF., Rb.
Conyza triloba Decne. In Egypt confined only to Sinai.
CAI : GD.
Cotula cinerea Del. In sandy places.
CAI : WGr.
AST : WF.
Echinops glaberrimus DC.
CAI : GD.
AST : GS.
Echinops macrochaetus Fres. In Egypt confined only to Sinai; the records of GE. refer to another species, *E. hussoni* Boiss.
AST : GS.
Filago spathulata Presl. v. *prostrata* (Parl.) Boiss.
AST : Rb.
Gnaphalium luteo-album L. Especially along ditches.
AST : Rb.

Iphiona mucronata (Forssk.) Asch. & Schweinf. In rocky places.
AST : WArb.
Iphiona scabra DC. On mountain sides.
CAI : OF.
Lactuca orientalis Boiss. Spinescent shrub with narrow green stripes on the stems.
CAI : GD., WArb., DArb.
AST : Rb.
Lactuca saligna L.
AST : Rb.
Lactuca undulata Ledeb. In Egypt confined to Sinai.
AST : Rb.
Lagoseris sancta (L.) K. Maly.
CAI : GM. stepway, HF.
Lasiopogon muscoides (Desf.) DC.
CAI : FG., cultivated area near StCa.
Launaea capitata (Spreng.) Dandy. In sandy ground.
CAI : WGr.
Launaea nudicaulis (L.) Hook. f.
CAI : WGr., WArb., beginning of Ra.
Launaea spinosa (Forssk.) Sch. Bip. Highly poisonous.
CAI : GD.
Leyssera capillifolia (Willd.) Spreng. On rocky slopes.
Onopordon ambiguum Fres.
CAI : DArb., GM.
AST : Rb.
Phaeopappus scoparius Boiss. On rocky ground. Flowers white, drying yellow.
CAI : end of Ra., GD.
AST : GM., WFu., GS.
Phagnalon nitidum Fres.
CAI : GD., GM. stepway, beginning of Ra.
ç *Pulicaria arabica* (L.) Cass. v. *demissa* Boiss. New record to Sinai.
CAI : FG.

Pulicaria crispa (Forssk.) Benth. & Hook. f. In gardens.
CAI : OF.
AST : WF., GM., WFu.
Pulicaria inuloides (Poir.) DC.
CAI : DArb., WArb.
AST : WArb., Rb.
Pulicaria undulata (L.) Kostel. Strong-scented, used as tea by Bedouins.
CAI : WArb.
AST : GS., WFu.
Pyrethrum santolinoides DC. Strong-scented. In Egypt confined only to the Sinai mountains.
CAI : StCa., GM. stepway, WArb.
AST : GM.
ç *Sonchus asper* (L.) Hill. New record to Sinai.
CAI : WGr.
Sonchus oleraceus L. Weed in cultivated ground.
CAI : DArb.
AST : Rb.
Varthemia montana (Vahl) Boiss. On rocky ground.
CAI : GD.
AST : GM., GD.
ç *Xanthium brasilicum* Vellozo. New record to Sinai.
Grows in cultivated ground.
AST : OF.

Convolvulaceae

Convolvulus arvensis L. In cultivated ground.
AST : OF.
Convolvulus hystrix Vahl. Has beautiful blue flowers.
AST : WF.
Cressa cretica L. In salty soil near springs.
CAI : WGr.

Cruciferae

Alyssum marginatum Steud. ex Boiss. In rock fissures. In Egypt confined to Sinai only.

CAI : WArb.
Arabidopsis pumila (Steph.) Bush v. *xerophila* O. E. Schulz.
CAI : Stepway to GM.
Arabis auriculata Lam. v. *sinaica* Boiss. In Egypt confined only to Sinai.
CAI : GM. stepway.
Clypeola jonthlaspi L. v. *hispida* Hal. In stony places.
In Egypt confined to Sinai.
CAI : DArb.
Diplotaxis harra (Forssk.) Boiss.
CAI : StCa., WArb., Ra., WHF.
AST : WArb., WFu.
ç *Enarthrocarpus lyratus* (Forssk.) Decne. Weed. New record to Sinai.
AST : Rb.
Eremobium aegyptiacum (Spr.) Hochr.
AST : WFu.
Farsetia aegyptia Turra.
AST : WFu.
Isatis microcarpa J. Gay in Boiss.
CAI : WArb.
Lepidium draba L. Weed in gardens.
AST : OF., Rb.
Lepidium sativum L. Weed in gardens.
AST : OF., Rb.
Malcolmia africana (L.) R. Br. In Egypt confined to Sinai.
CAI : WArb.
AST : Rb., DArb.
Matthiola arabica Boiss. In Egypt confined to Sinai. Mountain plant.
CAI : StCa., GM. stepway, GD.
AST : GM., WArb., WFu.
Morettia canescens Boiss. v. *parviflora* Boiss. In Egypt confined to Sinai.
CAI : OF.
Sisymbrium irio L. Weed in gardens. The type growing here is of dwarf growth and dark green.

CAI : DArb.
AST : OF., Rb., DArb.

Sisymbrium orientale L. Weed in cultivated ground.
CAI : OF.
AST : OF. This is the only place in Egypt where it is found.

Sisymbrium septulatum DC. v. *rigidum* (Decne) O.E. Schulz. Weed. In Egypt confined to Sinai.
CAI : DArb., WArb.

Zilla spinosa (Turra) Prantl.
AST : GM., WFu., WSh.

CUCURBITACEAE

Colocynthis vulgaris Schrad.
AST : WF.

CYPERACEAE

Carex distans L. v. *sinaica* (Nees) Boeck.
CAI : WArb.
AST : WArb.

ç *Cyperus difformis* L. New record to Sinai.
AST : FG.

Cyperus laevigatus L. v. *distachyos* (All.) Coss. & DR.
CAI : WGr. near the spring.
AST : FG.

ç *Cyperus rotundus* L. In gardens as weed. New record to Sinai.
AST : Rb.

Scirpus holoschoenus L. v. *australis* (Murr. ex. L.) Koch.
CAI : FG., GM. stepway, WArb.
AST : FG.

EQUISETACEAE

Equisetum ramosissimum Desf. In wet places under rocks. In Egypt confined to Sinai.
AST : FG., WArb.

EUPHORBIACEAE

Andrachne aspera Spreng.
CAI : GD.
AST : GD.

Chrozophora oblongifolia (Del.) A. Juss. ex Spreng.
CAI : OF.
AST : OF.

ç *Chrozophora plicata* (Vahl) A. Juss. ex Spreng. New record to Sinai.
AST : OF.

ç *Chrozophora verbascifolia* (Willd.) A. Juss. New record to Sinai.
CAI : OF.

ç *Euphorbia aegyptiaca* Boiss. Weed. New record to Sinai.
AST : Rb.

Euphorbia kahirensis Raeusch. Sandy desert places.
CAI : WSh., Sht.

Euphorbia peplus L. Weed.
CAI : DArb.
AST : Rb., DArb.

FRANKENIACEAE

Frankenia pulverulenta L. In salty moist places.
CAI : HF.

GENTIANACEAE

Centaurium pulchellum (Sw.) Druce. Along ditches.
AST : Rb., OF.

GERANIACEAE

Erodium bryoniaefolium Boiss.
CAI : Ra.

Erodium cicutarium (L.) L'Hér.
CAI : WArb.
AST : Rb.

Erodium malacoides (L.) Willd. New record to Sinai.
AST : Rb.

Erodium pulverulentum (Cav.) Willd.
CAI : DArb., WArb.
AST : WArb., Rb., OF.

GLOBULARICEAE

Globularia arabica Jaub. et Sp.
AST : WFu.

GNETACEAE

Ephedra alata Decne.
CAI : WF., WHF., near StCa.
AST : WF., WFu.
Ephedra alte C. A. Mey.
CAI : GM. stepway.
AST : WFu.

GRAMINEAE

Aeluropus littoralis (Gouan) Parl. In salty moist ground.
CAI : HF.
Agrostis semiverticillata (Forssk.) Christens. Weed.
CAI : WArb.
AST : Rb., OF.
Aristida adscensionis L. v. *pumila* Coss. & DR.
CAI : WArb.
Aristida ciliata Desf.
CAI : GD., beginning of Ra.
Aristida coerulescens Desf. v. *arabica* Henr. In rock fissures. In Egypt confined to Sinai.
CAI : GD., Ra., OF.
Aristida hirtigluma Steud. On mountain slopes.
CAI : WF.
Aristida plumosa L. On mountain slopes.
AST : near OF.
Avena alba Vahl.
AST : Rb.

ç *Avena fatua* L. New record to Sinai.
CAI : StCa., FG.
ç *Avena sterilis* L. v. *ludoviciana* (Dur.) Gill. & Magne. New record to Sinai.
CAI : WArb.
ç *Brachiaria cruciformis* (Sibth. & Sm.) Griseb. Weed. New record to Sinai.
AST : Rb.
Bromus sinaicus (Hack.) Täckh. In Egypt confined to Sinai.
CAI : HF.
AST : FG., Rb., DArb.
Bromus tectorum L.
CAI : near StCa., GM. stepway, FG., WArb., DArb.
AST : Rb.
Cutandia memphitica (Spr.) Benth.
CAI : WGr.
Cynodon dactylon L.
AST : OF., Rb.
Echinochloa colonum (L.) Link.
AST : OF.
Eremopyrum buonapartis (Spr.) Nevski. In moist salty places. In Egypt confined to Sinai.
AST : GM. stepway, WArb.
Hordeum leporinum Link.
CAI : DArb.
AST : Rb.
Hyparrhenia hirta (L.) Stapf.
CAI : GD., WF., OF.
Imperata cylindrica (L.) Beauv.
CAI : WGr.
AST : Rb.
Koeleria pumila (Desf.) Domin.
AST : Rb.
ç *Lolium perenne* L. New record to Sinai.
AST : Rb., GM. stepway.

Melica inaequiglumis Boiss. v. *supratomentosa* Bornm. ex Papp. In Egypt confined to Sinai.
CAI : FG.
Melica pannosa Boiss. & Ky. v. *schimperi* Papp. In Egypt confined to Sinai.
CAI : GM. stepway.
Oryzopsis miliacea (L.) Asch. & Schweinf.
CAI : GM. stepway.
ç *Paspalum distichum* L. New record to Sinai.
AST : OF.
Pennisetum dichotomum (Forssk.) Del. On mountain slopes.
CAI : OF.
Pennisetum orientale Rich. ex Pers.
CAI : GM. stepway.
Polypogon monspeliensis (L.) Desf.
CAI : OF., FG., WGr.
AST : OF., Rb.
Schismus barbatus (L.) Thell.
CAI : DArb.
AST : WArb.
Setaria verticillata (L.) Beauv. v. *ambigua* (Guss.) Richt.
AST : Rb.
ç *Setaria viridis* (L.) Beauv. New record to Sinai.
AST : Rb.
Stipa barbata Desf. On rocky ground. In Egypt confined to Sinai.
CAI : GM. stepway, WArb.
Stipa parviflora Desf. On mountains slopes.
CAI : StCa., WArb., DArb., beginning of Ra.
AST : near OF.
Taeniatherum caput-medusae (L.) Nevski v. *crinitus* (Schreb.) Asch. & Graebn. ex Maire. In gardens in moist places. In Egypt confined to Sinai.
CAI : WArb.
Trachynia distachya (L.) Link. In cultivated ground.

CAI : OF., DArb.
AST : Rb.
Tricholaena teneriffae (L. f.) Link
CAI : GD., Ra.
Vulpia bromoides (L.) S. F. Gray.
CAI : GM. stepway.

HYPERICACEAE

Hypericum sinaicum Hochst. Endemic in the Sinai mountains.
CAI : WArb., DArb.
AST : Rb.

JUGLANDACEAE

Juglans regia L. Cultivated in gardens.
CAI : DArb.
AST : DArb.

JUNCACEAE

Juncus arabicus (Asch. et Buch.) Adams.
CAI : WGr., HF., WArb. (but not typical).

LABIATAE

Ajuga chia (Poir.) Schreb. v. *tridactylites* Boiss. In Egypt confined to Sinai.
CAI : GM. stepway.
AST : WArb.
Ballota kaiseri Täckh. At mountain edges. Endemic in Sinai.
CAI : GD.
Ballota undulata (Fres.) Benth.
CAI : GD.
AST : GM., WArb.
Lamium amplexicaule L. Weed in gardens.
CAI : DArb.
Lavandula pubescens Decne.
CAI : GD., Ra.
AST : WArb.

Lavandula stricta Del.
CAI : OF.
Mentha lavandulacea Boiss. In Egypt confined to Sinai.
CAI : WArb.
AST : WArb.
Micromeria sinaica Benth. In Egypt confined to Sinai.
CAI : StCa.
Nepeta septemcrenata Ehrenb. Endemic in Sinai.
CAI : GM. stepway, WArb.
AST : GM., Rb.
Origanum syriacum L. v. *aegyptiacum* (L.) Täckh.
CAI : StCa., GD., GM. stepway, WArb.
AST : GD., GM., WArb., WFu.
Phlomis aurea Decne. On rocky slopes. Endemic in Sinai.
CAI : outside StCa., GD.
AST : GD., GM. stepway.
Salvia deserti Decne. On mountain ridges.
CAI : OF., entrance of Ra.
Stachys aegyptiaca Pers. On rocky ground.
CAI : near StCa., GD., WArb.
AST : WArb., WFu.
Teucrium leucocladum Boiss. On mountain slopes.
CAI : OF., WArb.
AST : GD., GM.
Teucium pilosum (Decne) Asch. & Schweinf. v. *kaiseri* Täckh. Endemic in Sinai.
CAI : GD., GM. stepway, WArb.
Thymus decussatus Benth.
CAI : GD., GM. stepway, FG.

Leguminosae

Acacia raddiana Savi.
CAI : entrance of OF.
AST : OF.
Alhagi maurorum Medic. In salty places.

CAI : WGr.
AST : entrance of OF.
Astragalus bombycinus Boiss.
CAI : FG.
AST : WArb.
Astragalus echinus DC. In Egypt confined to the Sinai mountains.
CAI : FG.
Astragalus sieberi DC.
AST : GM.
Astragalus spinosus (Forssk.) Muschl. On mountain ridges.
CAI : entrance of Ra.
Astragalus tribuloides Del.
AST : Rb. The form which occurs in Sinai approaches v. *mareoticus* Sirj. but legumes are adpressed hairy.
Cassia senna L.
AST : WF.
Medicago hispida Gaertn. Weed in cultivated areas.
CAI : OF.
AST : Rb.
Medicago truncatula Gaertn. Weed in cultivated areas.
CAI : OF.
Melilotus indicus (L.) All. Weed in cultivated ground.
CAI : WGr., DArb.
AST : StCa., Rb.
ç *Melilotus siculus* (Turra) Vitm. ex Jacks. Weed. New record to Sinai.
AST : Rb.
Psoralea bituminosa L. In Egypt confined to Sinai mountains.
CAI : GD.
Retama raetam (Forssk.) Webb & Berth.
CAI : WF., WArb.
AST : WF.
ç *Taverniera aegyptiaca* Boiss. New record to Sinai.
AST : WF.
ç *Trigonella hamosa* L. Weed. New record to Sinai.
AST : Rb.

ç *Trigonella laciniata* L. v. *bicolor* Schweinf. New record to Sinai.
AST : Rb., StCa.
Trigonella stellata Forssk.
CAI : OF.
ç *Vicia cinerea* M. Bieb. New record to Sinai.
AST : Rb.

LILIACEAE

Asparagus stipularis Forssk. v. *tenuispinus* Holmb.
CAI : WArb.
Asphodelus fistulosus L. v. *tenuifolius* Cav. Mountain ridges.
CAI : OF.

MALVACEAE

Althaea rufescens Boiss.
CAI : DArb.
AST : WArb., Rb.
Malva rotundifolia L. Weed in cultivated places. In Egypt confined to Sinai.
CAI : DArb.
AST : StCa., DArb., Rb.

MORACEAE

Ficus pseudosycomorus Decne.
CAI : GD., GM. stepway.
AST : GD., GM. stepway.

MORINGACEAE

Moringa peregrina (Forssk.) Fiori. At the foot of very high mountains. Has beautiful white flowers.
CAI : entrance of WF., near OF.
AST : WF.

OROBANCHACEAE

ç *Cistanche mongolica* G. Beck. Has purely white flowers. New record to Egypt.

AST : WFu. in Abu Zeituna garden.

The find is not surprising, as the species has its main distribution in Buchara and West Mongolia and the mountain flora of Sinai has many elements in common with the mountain region of the Middle East.

Orobanche cernua Loefl. v. *desertorum* G. Beck. Weed in gardens.
CAI : StCa.
ç *Orobanche crenata* Forssk. Weed. New record to Sinai.
AST : OF.

PAPAVERACEAE

Fumaria parviflora Lam. v. *sinaitica* Hausskn. Weed. Endemic in Sinai.
CAI : OF.
AST : OF., Rb.
Glaucium arabicum Fres. Endemic in Isthmic desert and Sinai.
CAI : WArb., end of Ra.
AST : Rb.
Hypecoum parviflorum Kar. & Kir.
AST : Rb.
Papaver decaisnei Hochst. et St.
CAI : DArb.
AST : DArb., Rb.
Roemeria hybrida (L.) DC. subsp. *dodecandra* (Forssk.) Maire.
CAI : GM. stepway.

PLANTAGINACEAE

Plantago arabica Boiss. In Egypt confined to Sinai. Mountain plant.
CAI : StCa., GD., GM. stepway, WArb.
AST : GD., GM. stepway.

PLUMBAGINACEAE

Limonium pruinosum (L.) Ktze. On rocky slopes.
AST : WF.

POLYGALACEAE

Polygala scoparia H. B. & K. In dry rock fissures. Endemic in Sinai.
CAI : GM. stepway.

POLYGONACEAE

Atraphaxis spinosa L. v. *sinaica* Boiss.
CAI : GM. stepway.

POLYPODIACEAE

Adiantum capillus-veneris L.
CAI : StCa.
AST : Bir El Banat of StCa., WArb.
Notholaena vellea (Ait.) Desv. In rock fissures.
CAI : entrance of Ra.

PORTULACACEAE

ç *Portulaca oleracea* L. Weed. New record to Sinai.
AST : OF.

PRIMULACEAE

Anagallis arvensis L. v. *phoenicea* Gr. & Godr. Weed.
CAI : StCa.
AST : OF., DArb., Rb.
Samolus valerandi L. Along ditches and in moist places.
AST : OF.

RESEDACEAE

Caylusea hexagyna (Forssk.) M. L. Green.
CAI : OF., near StCa., GD., WArb., Ra.
AST : Rb.
Ochradenus baccatus Del.
CAI : WHF.
AST :WF., Rb.
Reseda muricata Presl.
AST : WFu.

Reseda pruinosa Del.
CAI : entrance of Ra., Rb.
AST : GD.

RHAMNACEAE

Rhamnus disperma Ehrenb. On rocky slopes.
AST : GM. stepway.
Ziziphus spina-christi (L.) Willd.
AST : OF.

ROSACEAE

Cotoneaster orbicularis Schlecht. Endemic in the Sinai mountains.
AST : GM. stepway.
Crataegus sinaica Boiss. On rocky slopes. In Egypt confined to Sinai.
CAI : GM. stepway.
AST : GM. stepway.
Poterium verrucosum Ehrenb. Weed in gardens.
CAI : DArb.

RUBIACEAE

Crucianella membranacea Boiss.
AST : Rb.
Galium setaceum Lam. v. *decaisnei* (Boiss.) Ehrenb.
In Egypt confined to Sinai only.
CAI : GM. stepway.
AST : GM. stepway, WArb., Rb.
Galium sinaicum Boiss. Endemic in the Sinai mountains.
CAI : GD., GM. stepway, WArb.
AST : Rb.
Galium spurium L. v. *tenerum* Gr. & Godr.
CAI : GM. stepway.
Galium tricorne Stokes ex With v. *ceratopodum* Boiss.
In Egypt only confined to Sinai.
CAI : GM. stepway.
AST : Rb.

RUTACEAE

Haplophyllum longifolium Boiss.
AST : WFu.

SALICACEAE

Populus alba L. Cultivated.
AST : GD.
Populus pyramidalis Rozier ex Lam. Cultivated.
CAI : GM. stepway.

SCROPHULARIACEAE

Anarrhinum pubescens Fres. On granitic rocks. Endemic in Sinai.
CAI : GD.
Linaria acerbiana Boiss. In mountain crevices.
CAI : near OF.
Linaria aegyptiaca (L.) Dum.-Cours. On mountain ridges.
CAI : beginning of Ra.
Linaria macilenta Decne. In Egypt confined to Sinai.
CAI : near StCa., Ra.
Scrophularia deserti Del.
AST : WF.
ç *Scrophularia hypericifolia* Wydl. The first sure record from Sinai.
CAI : GM. stepway, WArb.
Scrophularia libanotica Boiss. In Egypt confined to Sinai.
CAI : near StCa.
AST : Rb.
Scrophularia xanthoglossa Boiss. v. *deserticola* Eig.
CAI : GD., GM. stepway, FG.
Verbascum sinaiticum Benth.
CAI : near StCa., GD.
Veronica campylopoda Boiss.
CAI : GM. stepway, DArb.
AST : DArb., Rb.
Veronica kaiseri Täckh. Endemic in Sinai.
CAI : near StCa., GM. stepway.

ç *Veronica musa* Täckh. & Hadidi nov. sp.
CAI : near StCa., GM. stepway, OF.
AST : GM. stepway.
Holotype : On the stepway of Gebl Musa (Hadidi 1956), kept in CAI. It is named after this locality.

Herba annua, siccitate nigricanta, parva, ad 5-6 cm. alta, simplex vel basi ramosa, glabra vel superne breviter et parce glanduloso-puberula. Foliis sessilibus sparse dentatis, floralibus anguste lineari-lanceolatis, pedicello dimidio brevioribus. Racemis laxis, pedicellis filiformibus, glandulosis, calyce duplo longioribus, fructiferis erecto-patulis ad 6 mm. longis. Calycis segmentis trinervis, corolla minuta calyce breviore. Capsula parva, stylo sinu multo longiore.

The plant is about 5 cm. high, bracts are about half as long as the glandular pedicels. Flowers are very small with 3-nerved sepals. The style is longer than the sinus of the capsule.

This plant is nearly related to *V. biloba, V. syriaca* and *V. macropoda*. However, *V. syriaca* has much larger flowers ; *V. biloba* has shorter style and non-glandular pedicels which are equal in length to the bracts and also to the calyx ; *V. macropoda* has longer pedicels, 16-22 mm., and small bracts, much less than half of the pedicel.

SOLANACEAE

ç *Hyoscyamus boveanus* (Dun. in DC.) Asch. et Schweinf.
CAI : WF., outside StCa.
AST : WF., WFu.

In Students' Flora this is put as a synonym to *H. muticus* L., the same idea which is also expressed in Index Kewensis. However, a rich material of it has recently been collected in Sinai and S. Egypt, and the author is now persuaded that it is a good species which should be maintained as an independent taxon.

Already at a first glance it looks quite different from ordinary *H. muticus*. It is densely beset with spreading hairs, and the

flowers are white with purple blotches and stripes and with anthers and filaments cream-coloured.

Schweinfurth collected it in Da. sept. (Wadi Omm Moumfeh and Wadi Abou Marwah, see P. Ascherson & G. Schweinfurth, 1889); Täckholm et al. in Da. mer. (Hurghada district, material in CAI).

Hyoscyamus muticus L.
AST : WF.

Hyoscyamus pusillus L.
CAI : near StCa., FG.
AST : near StCa., Rb.

Lycium arabicum Schweinf.
AST : WF.

Solanum nigrum L.
AST : WArb.

Solanum sinaicum Boiss. In Egypt confined to Sinai.
CAI : OF., GD., WArb.
AST : OF.

TAMARICACEAE

Tamarix aphylla (L.) Karst.
CAI : AM., WHF.
AST : AM.

Tamarix nilotica (Ehrenb.) Bge v. *mannifera* (Ehrenb.) Schweinf.
CAI : WGr., Bab El Mahmal of WF., DArb.
AST : WF.

Reaumuria hirtella Jaub. & Sp. On mountain ridges.
CAI : WF.
AST : WFu.

TYPHACEAE

Typha australis Schum. & Thonn.
CAI : WGr.

UMBELLIFERAE

Ammi majus L. Weed in cultivated ground.
CAI : DArb.
AST : Rb.

Bupleurum exaltatum Bieb. v. *linearifolium* Boiss. Endemic in the Sinai mountains.
CAI : WArb.

Pityranthus tortuosus (Desf.) Benth. & Hook. f.
AST : WF.

Pityranthus triradiatus (Hochst.) Asch. & Schweinf.
CAI : WArb.
AST : GD., GM. stepway.

Scandicium stellatum (Sol.) Thell. In Egypt confined to Sinai.
CAI : GM. stepway.
AST : WArb., Rb.

URTICACEAE

Parietaria alsinifolia Del. In shady protected places.
CAI : WArb.
AST : WArb., Rb.

ZYGOPHYLLACEAE

ç *Balanites aegyptiaca* (L.) Del. New record to Sinai.
AST : entrance of WF.

Fagonia arabica L.
CAI : WGr.
AST : WF.

Fagonia bruguieri DC.
CAI : GD., WArb., entrance of Ra., OF.

Fagonia tristis Sickenb. v. *boveana* Hadidi.
CAI : outside StCa., FG., Ra.
AST : GM., WFu.

Fagonia myriacantha Boiss.
CAI : Ra.

ç *Fagonia thebaica* Boiss. New record to Sinai.
AST : WFu.
Nitraria retusa (Forssk.) Asch.
CAI : WGr., AZ.
AST : entrance of WF.
Peganum harmala L.
CAI : outside OF., GD., WArb.
AST : GD., DArb., GS., WFu.
Zygophyllum album L. f.
CAI : WGr., WF., AZ.
AST : entrance of WF.
Zygophyllum coccineum L.
CAI : Sht.
AST : WF.
Zygophyllum decumbens Del.
AST : WF.
Zygophyllum dumosum Boiss. On rock edges.
CAI : WGr., WHF.
Zygophyllum simplex L.
CAI : WGr.
AST : WFu.

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PETROGRAPHIC NOTES
ON SOME CHARNOCKITIC ROCKS
FROM THE SUDAN

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ABSTRACT

The paper describes some rocks of charnockitic affinities recorded among the basement complex of the Sudan. They appear to show all gradations from the ultrabasic types through the basic and the intermediate members to the acid rocks.

Petrographic data are presented for members of the charnockitic series and associated country rocks. It is argued that a metasedimentary origin seems to be indicated for the southern Sudan charnockites while others may possibly represent metamorphosed igneous rocks.

INTRODUCTION

Rocks of charnockitic affinities are reasonably well displayed in the Pre-Cambrian basement complex of the Sudan. They have been recorded from the Blue Nile Province (Gebel Moya, Sennar Area) and the southern provinces. Charnockitic rocks have a wide geographical distribution in the southern provinces and are possibly continued in Uganda. They have been recognized from the Upper Nile Province (Pibor-Post Area), Equatoria Province (Juba, Nimule and Madial Areas) and Bahr El-Ghazal Province (Wau Area). (See Chart I and Location Maps, Charts II and III).

Generally speaking, the Pre-Cambrian rocks of Africa have been shown to include charnockitic rocks described from various areas. However,

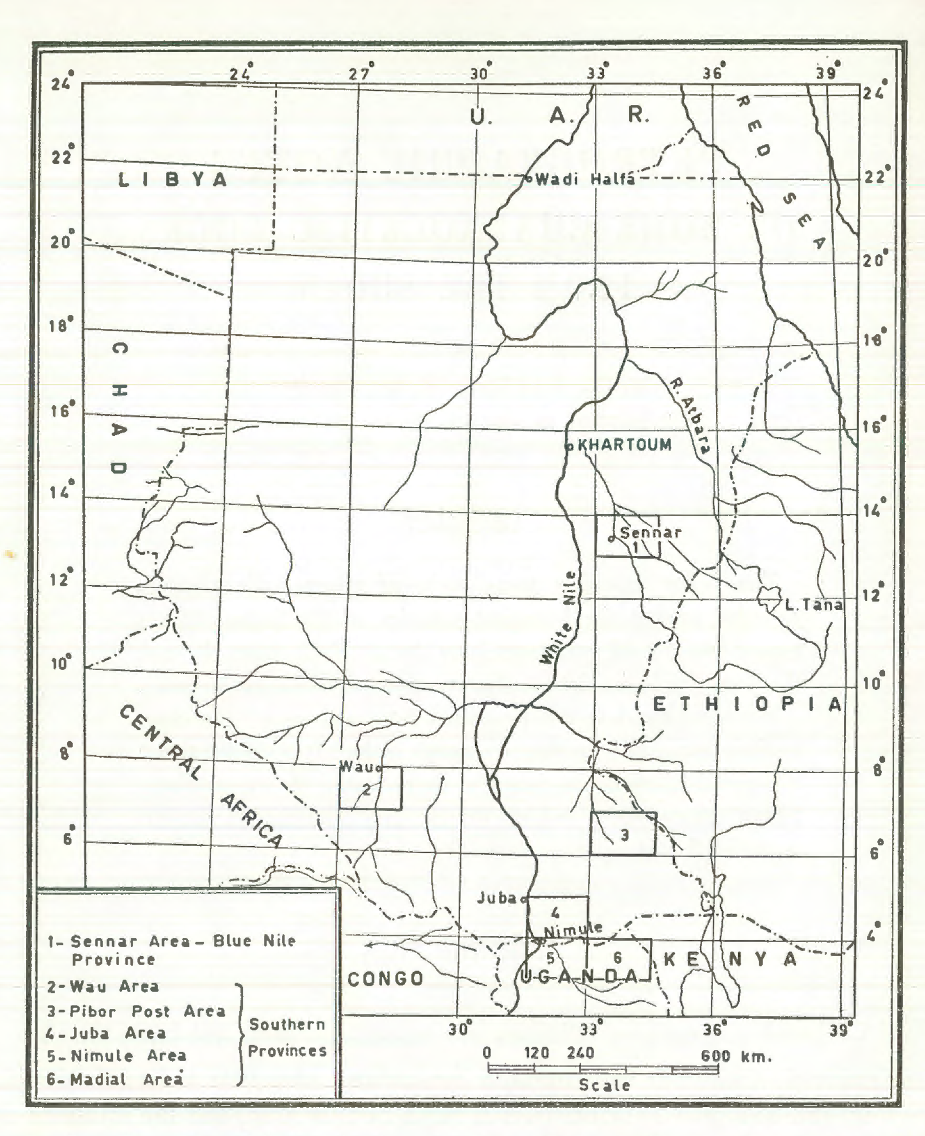


Chart I. — Map of Sudan showing areas from which examples are taken in text.

many of these African occurrences have been claimed to belong to the charnockite series, following the recognition and description of a new series of dark hypersthene—bearing rocks from Madras, India (Holland, 1900). Since that time the charnockites attracted the attention of several workers on the geology of Africa.

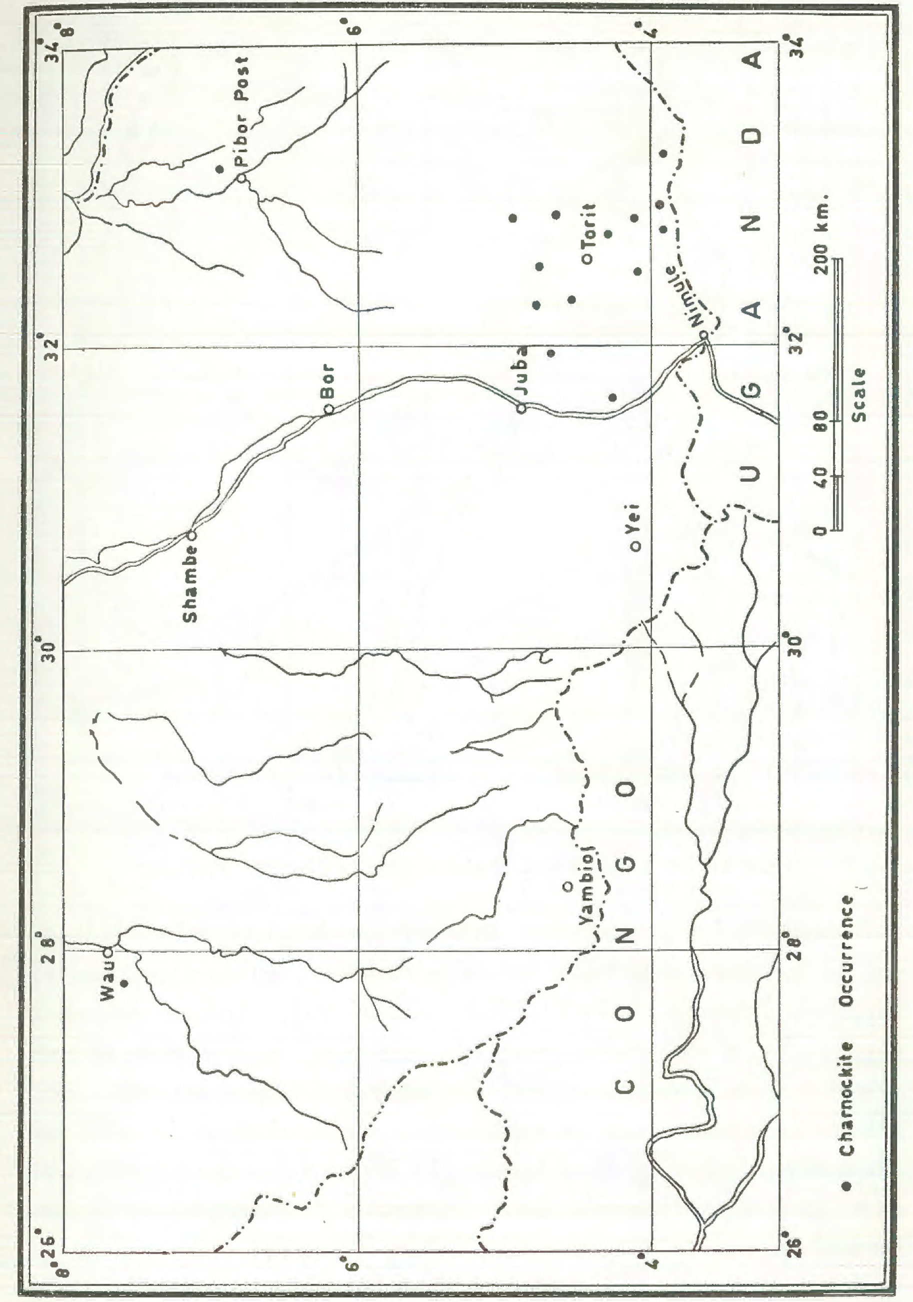


Chart II. — Location map of charnockites in southern provinces.

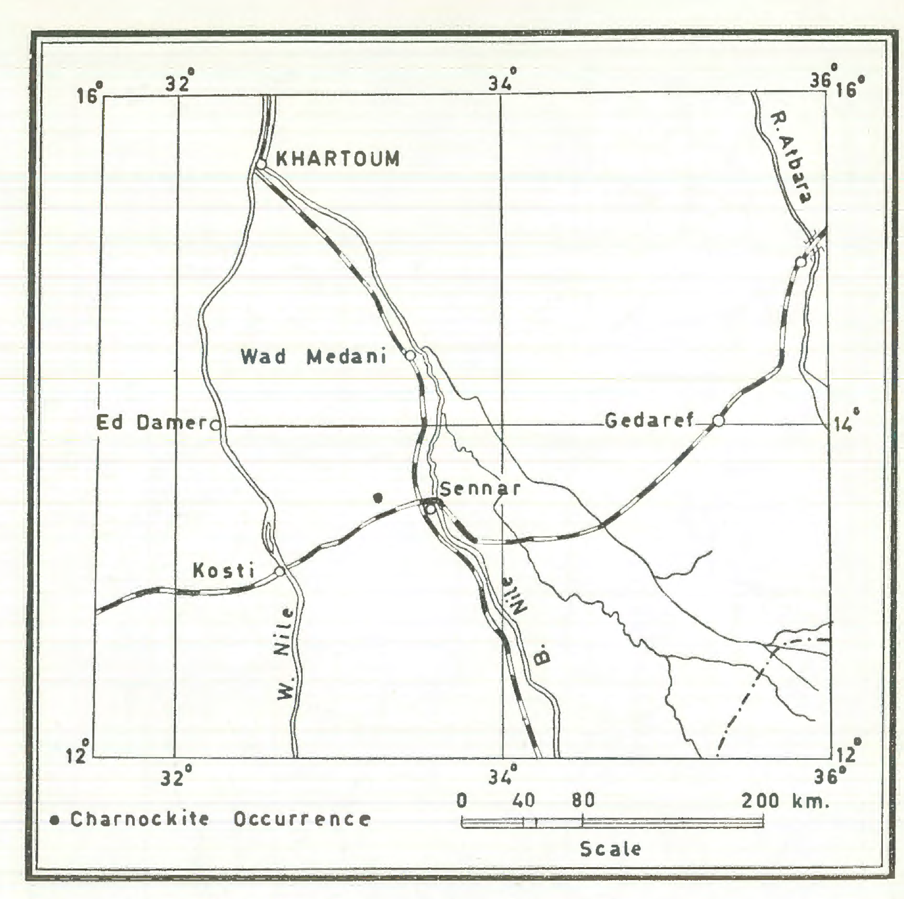


Chart III. — Location map of charnockites in Blue Nile Province.

Previous Work : In the Sudan, hypersthene–bearing gneisses belonging to the charnockite series were reported from the southern part of Equatoria Province (Andrew, 1948, pp. 94-95). Andrew described these rocks as « a peculiar group of granoblastic, foliated basic to acid gneisses with hypersthene and transparent feldspar intruded into foliated para-schists and para-gneisses». Charnockitic rocks of Gebel Moya were studied by W. Iskander (1958) who described these rocks as « quartz-hypersthene diorites». He further gave a geological sketch-map of the area to the scale of 1:50,000 (Chart IV).

Howie (1958) in a review of African charnockites described some charnockitic rocks from the Imatong and Lafit Hills in southern Equa-

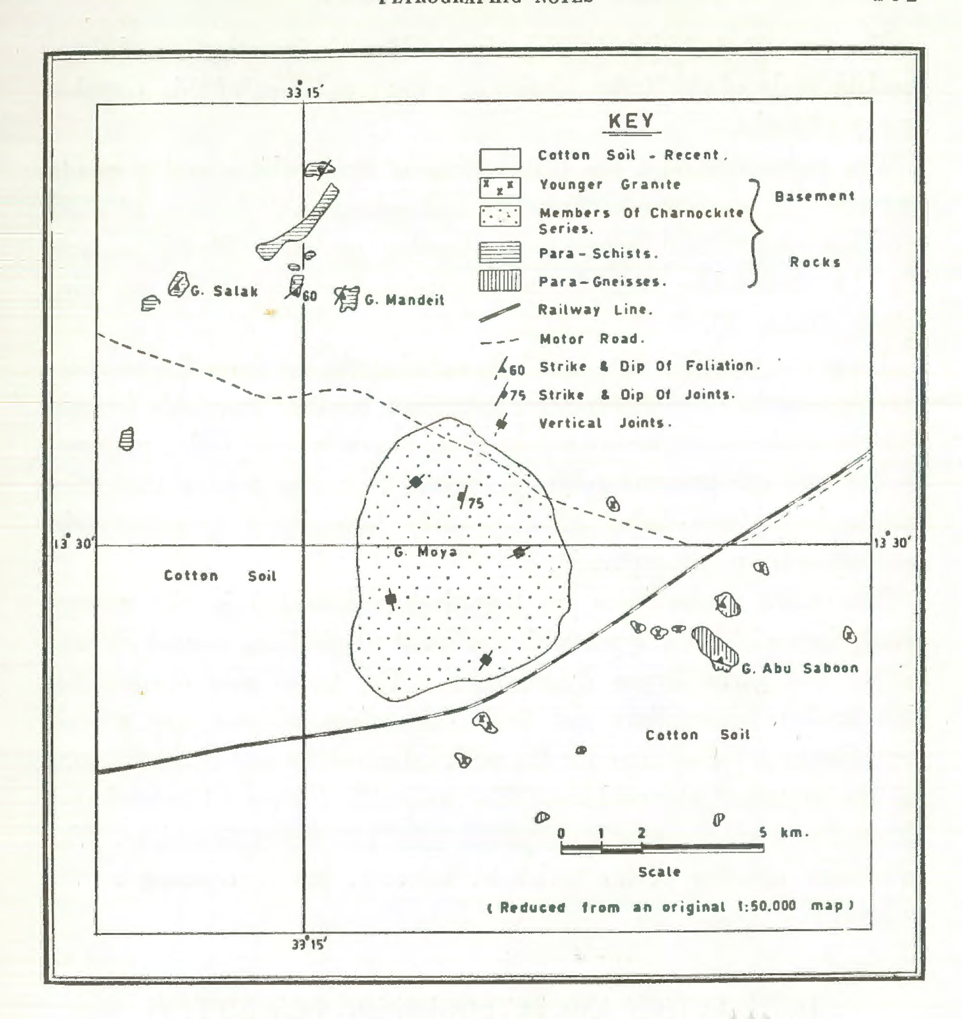


Chart IV. — Exposure geological map of Gebel Moya (After W. Iskander).

toria and also from Gebel Moya. He mentioned the petrographic characters of some examples referring them to acid, intermediate, basic and ultrabasic members of the charnockite series. Howie presented the modal analysis for 14 charnockitic and associated rocks and their trace elements. He further gave the chemical analysis of a basic charnockite from the Lafit Hills, its orthopyroxene, clinopyroxene and hornblende.

The present study is a continuation of Howie's investigation of charnockitic rocks of the Sudan aiming at a more coverage of this complex group of rocks.

The paper discusses the distribution of charnockites and presents the essential macroscopic characters and petrographic features of charnockites and related hypersthene—bearing gneisses. Modal analysis for 15 charnockite examples and associated country rocks are also given (Table I).

From the available data it is believed that the southern Sudan charnockites might have formed from sediments for they invariably include interbanded calc-magnesian silicate granoblastic foliated rocks, psammo-pelitic and calc-psammo-pelitic gneisses. It is also argued that other charnockites from Gebel Moya possibly represented igneous rocks subsequently metamorphosed.

The acidic charnockites are tentatively subdivided in the present study into enderbitic types with dominant plagioclase, normal charnockites and garnetiferous charnockites. The terms acid charnockite, intermediate charnockite and basic charnockite without any genetic significance are used here for the acid, intermediate and basic divisions of the examined charnockites. The unqualified term « Charnockites» is used as a group name synonymous with « Charnockite series». The ultrabasic member of the series is, however, not as common as the others.

DISTRIBUTION AND PETROGRAPHIC DESCRIPTION

For the sake of convenience, the Sudan charnockites are described under two main geographical units as follows :

(I) The Southern Sudan Charnockites :

Rocks belonging to the charnockite series have been recorded from the southern provinces. These rocks generally form outcrops of several conspicuous features as Acholi, Imatong, Lafit, Liria, Longairo, Lowe Luluba and Labalwa in Juba area, Lomariti and Lolibai in Nimule area. (See table II for location of charnockites)

Table I

Modal Analysis of Charnockitic and Associated Country Rocks in the Present Work

Rock No.	7904* %	7284 %	7432 %	7536 %	4725 %	4724a %	8744 %	7977 %	8748 %	7947 %	7916 %	7966 %	5129 %	5130 %	8745 %
Quartz	26.7	24.2	24.0	32.5	20.5	16.0	30.3	16.8	21.8	31.7	10.5	—	23.5	36.8	45.0
K-Feldspar	6.0	4.0	4.0	29.9	38.3	29.7	9.7	14.7	26.0	21.6	4.0	—	—	—	—
Plagioclase	60.0	66.0	61.8	18.3	11.0	17.0	24.8	52.5	18.5	20.7	33.5	1.5	41.1	41.1	29.4
Orthopyroxene	x	3.0	x	5.3	2.3	9.4	17.0	8.3	8.7	2.3	16.4	38.5	—	—	—
Clinopyroxene	4.0	2.0	6.4	3.0	12.3	7.6	5.5	x	12.4	3.3	12.7	45.0	—	—	—
Hornblende	3.0	1.0	—	8.8	10.4	—	—	—	1.5	18.0	20.0	15.0	19.0	10.1	—
Biotite	x	x	4.0	x	—	17.0	x	x	9.0	—	—	—	11.0	9.7	20.1
Garnet	—	—	—	—	—	—	10.0	3.5	—	—	—	—	—	—	5.3
Accessories	x	x	x	2.5	2.4	2.3	1.5	3.0	1.5	1.5	3.5	x	5.0	2.0	x

x = Less than 1 %.
(*) = Specimen number of Geol. Surv. Dept. Khartoum.

TABLE II

Approximate Location of Charnockite Specimens mentioned in Text

Rock No.	Locality	Latitude	Longitude
7904 *	Lafit Hills — Juba Area	4° 55' ½ N.	32° 36' E.
7284 *	Lafit Hills — Juba Area	4° 57' N.	32° 36' ½ E.
4725 *	Lafit Hills — Juba Area	4° 29' ½ N.	32° 52' E.
4724-A *	Lafit Hills — Juba Area	4° 29' ½ N.	32° 52' E.
8744 *	Gebel Labalwa — Juba Area	4° 26' ½ N.	32° 39' E.
7977 *	Luluba Hills — Juba Area	4° 34' ½ N.	31° 57' ½ E.
8748 *	Gebel Liria — Juba Area	4° 39' N.	32° 05' E.
7947 *	South of River Kimoro — Juba Area	4° 06' N.	32° 19' ½ E.
7916 *	Lafit Hills — Juba Area	4° 39' ½ N.	32° 50' E.
7966 *	Lowe Hills — Juba Area	4° 30' ½ N.	32° 09' ½ E.
4740	Lafit Hills — Juba Area	4° 44' N.	32° 38' ½ E.
7286	Lafit Hills — Juba Area	4° 40' N.	32° 49' E.
4721	Gebel Labalwa — Juba Area	4° 25' ½ N.	32° 38' E.
4735	Lafit Hills — Juba Area	4° 44' ½ N.	32° 38' E.
7432 *	Gebel Faragullah-Wau Area	7° 32' N.	27° 46' E.
7536 *	Lomariti-Lolibai-Hills-Nimule	3° 51' ½ N.	32° 47' E.
5115	Lomariti-Lolibai-Hills-Nimule	3° 55' N.	32° 54' E.
7939	Lomariti-Lolibai-Hills-Nimule	3° 54' ½ N.	32° 48' E.
556	Gebel Moya — Sennar Area	13° 27' N.	33° 14' E.
1660	Gebel Moya — Sennar Area	13° 38' N.	33° 19' ½ E.
7711 *	Gebel Moya — Sennar Area	13° 29' N.	33° 20' E.
7716 *	Gebel Moya — Sennar Area	13° 29' N.	33° 19' E.

Specimens with an asterisk are those described by the present writer.
Specimens without an asterisk are those examined by Howie.

The charnockites are generally associated with metasedimentary gneisses and schists. This association is characteristic of the charnockites in the southern Sudan as is the case in other charnockite occurrences in Africa, and Ceylon (cf. Lorel, 1958 and Cooray, 1962). These meta-sediments comprise some psammo-pelitic and calc-psammo-pelitic rocks. In handspecimen they are medium- to fine-grained rocks with well-developed gneissose texture. In thin section the calc-psammo-pelitic rocks (5129, 5130)[1] are shown to be formed essentially of clear quartz with occasional wavy extinction, plagioclase in the albite-oligoclase range, laths of strongly pleochroic biotite (straw-yellow to chestnut-brown) and moderately pleochroic hornblende with X= greenish-yellow, Y=olive-green, Z=brownish-green. Accessories include iron ores, apatite and Zircon in subhedral and anhedral grains.

The psammo-pelitic gneisses at Gebel Labalwa, Juba area, contain few garnets of the almandine variety (8745). In the same locality the para-gneisses are occasionally augened. The plagioclase augens show signs of strain with shadowy extinction and bent twin lamellae. The quartz also shows evidence of strain, each grain consisting of several optically related individuals all showing wavy extinction.

Charnockites of the southern provinces show gradations from the ultrabasic and basic types through the intermediate members to the acid rocks. The petrography of the various members of the charnockite series is given as follows :

A) *The Acidic Rocks :*

These rocks are tentatively subdivided into : (I) Enderbites, (II) Normal charnockites and (III) Garnetiferous charnockites.

(I) *Enderbites :*

These rocks are recorded from the Lafit Hills, Juba area and from Gebel Faragullah, Wau area. They have features which suggest that although they are acid charnockitic types, they more nearly approach enderbites than normal charnockites i. e. the dominant feldspar is plagioclase rather than potash feldspar (Tilley, 1936). In hand-specimen these rocks have generally an overall dark olive-brown appearance on the unweathered surface and a vitreous or almost greasy lustre. They have a granular texture but may show banding and a marked linear arrangement of the minerals. In thin section (7284, 7904, 7432) the

[1] Specimen number of the Geol. Surv. Dept. Khartoum.

dominant ferromagnesian mineral is a moderately pleochroic orthopyroxene. It occurs in irregular rounded and embayed grains with X= pink, Y=yellowish-green, Z=green. The dominant light minerals are abundant large quartz together with plagioclase as the dominant feldspar. The plagioclase is fresh with a composition in the oligoclase-andesine range. Twinning is, in general, well-developed and the plagioclase shows some signs of strain with shadowy extinction and bent twin lamellae. The quartz also shows evidence of strain each grain consisting of several optically related individuals all showing wavy extinction. Both the quartz and the feldspars are often traversed by thin yellow veins and stringers of some iron-bearing material common in many African and other charnockites (cf. Howie, 1958, and Cooray, 1962). Other dark minerals include weakly pleochroic clinopyroxene, hornblende (yellowish-green to dark-green) and laths of strongly pleochroic biotite (straw-yellow to dark-brown). Accessories include moderately abundant iron ores, subhedral and anhedral zircon and well-shaped apatite.

(II) *Normal Charnockites :*

These are presumably charnockites in the strict sense of the term i. e. orthoclase—quartz—hypersthene—iron ore rocks. They are recognized from the extreme southern slopes of the Lafit Hills, Juba area and from the Lomariti-Lolibai Hills, Nimule area. In handspecimen, these rocks have a granular texture sometimes exhibiting gneissose texture, with an overall dark olive-brown appearance, greasy lustre and medium—to fine—grain. In thin section (4724 A, 4725, 7536) the light minerals are abundant quartz which is often moderately strained and occurs in large grains each grain is made of several sub-individual crystals with sutured contacts. The petrography of one example was described by Howie. In other examples examined by the present writer feldspars are generally represented by microperthitic potash feldspar and weakly antiperthitic plagioclase; myrmekitic intergrowths are fairly common, often almost mantled by microperthite. The free plagioclase is not uncommon having a composition in the oligoclase range. Both the quartz and feldspars show the yellowish veins and

stringers noted in the enderbitic types. Both ortho—and clino—pyroxenes are present, the orthopyroxenes being more abundant and are seen to occur in moderately pleochroic irregular rounded grains with X= brownish-pink, Y=yellow-brown, Z=blue-green. The orthopyroxenes often have hornblende developed in the cleavages and at the crystal boundaries. In addition to its association with orthopyroxene the hornblende also occurs in large brownish-green separate crystals. The clinopyroxene is weakly pleochroic (light-green to medium-green). Accessories include laths of strongly pleochroic biotite (straw-yellow to dark-brown), iron ores, euhedral to subhedral zircon and apatite.

(III) *Garnetiferous Charnockites :*

These rocks are recorded from the south-eastern slopes of the Luluba Hills and from the Labalwa Hills Juba area. In handspecimen, they are generally of medium-grain and have a vitreous greasy lustre and a dark greenish brown appearance. Such features are regarded as typical of the acid members of the charnockite series. In thin section (7977, 8744) garnetiferous charnockites show a gneissose groundmass composed essentially of an association of quartz, feldspars, pyroxenes and biotite. Orthopyroxene is the dominant dark mineral which occurs in subhedral to irregular rounded grains showing moderate pleochroism with X= pink, Y=yellowish-pink, Z=light-green. Garnet occurs as irregular cracked grains which are completely isotropic. No relation could be observed between the orthopyroxene and garnet. Biotite was found in moderate amounts as strongly pleochroic laths (straw-yellow to dark-brown) and iron ores occur distributed throughout the rock. The term garnetiferous hypersthene-biotite gneisses is suggested for such charnockitic rocks presumably comparable to rocks from other charnockite areas (cf. Howie and Subramaniam, 1957 and Delhal, 1957).

B) *The Intermediate Rocks :*

The intermediate division of the charnockite series are recorded from several localities in Juba area. They occur in the west-central slopes of the Lafit Hills, near the junction of rivers Kimoro and Kit and in the Liria

Hills. In handspecimen these rocks show the typical charnockitic appearance. In thin section (7947, 8748) they are formed of a fine-grained association of ortho- and clino-pyroxenes, hornblende, plagioclase, potash feldspars and quartz. The petrography of one example was given by Howie (1958). Two other examples examined by the present writer show a gneissose texture; of the dark minerals clinopyroxenes are slightly more abundant than orthopyroxenes and occur in subhedral to rounded moderately pleochroic grains (light yellowish-green to light-green); some crystals are simple-twinned. The plagioclase is fresh with a composition in the oligoclase-andesine range. One of these examples (8748) is characterized by the presence of biotite as strongly pleochroic laths (straw-yellow to chestnut brown).

C) *The Basic Rocks :*

The basic group of the series occur in the Lafit Hills, Juba area and the Lomariti-Lolibai Hills, Nimule area. In handspecimen these rocks have a brownish appearance with an occasional reddish weathering product; they are fairly coarse-grained. In thin section (7916) basic charnockites are essentially formed of calcic plagioclase, quartz, clino- and ortho-pyroxenes and hornblende. A detailed petrography of one example was given by Howie (1958, pp. 7-8) who also mentioned the chemical analysis of the basic rock and its orthopyroxene, clinopyroxene and hornblende. One specimen examined by the present writer is petrographically similar to that described by Howie except for the slight abundance of the orthopyroxene than the clinopyroxene and the hornblende is pleochroic with X=pale-green, Y=green, and Z=deep-green. Another example examined by the writer is notable for the dominance of clinopyroxene and the presence of a few garnet crystals.

D) *The Ultrabasic Rocks :*

The ultrabasic members of the series are known from the Lafit and the Lowe Hills, Juba area. The petrography of one example was given by Howie (1958, p. 8) and which is shown to be identical with a specimen

described by the writer (7966). From the petrographic data and modal analysis it appears that the ultrabasic rocks may be closely matched with the pyroxenites from Madras, the type area for the charnockite series (cf. Holland, 1900, Washington, 1916 and Howie, 1958).

(II) The Blue Nile Charnockites :

Charnockitic rocks in the Blue Nile Province have been reported by the staff of the Geological Survey of the Sudan (Andrew 1951 and Iskander 1958). These rocks essentially form the conspicuous outcrop of Gebel Moya rising from the vast Gezira plain. It is approximately located at long. 33° 18' E., lat. 13° 30' N. and has an almost circular outcrop. Charnockitic rocks are almost confined to the main mass of the Gebel. The regional geology of the area was studied by W. Iskander who gave a geological sketch map to the scale of 1:50,000 (Chart IV). According to Iskander, the area is dominantly formed of basement complex rocks comprising para-gneisses and schists, charnockites and minor younger red granites.

Petrographically, the para-gneisses are essentially of granitic composition, whereas the para-schists comprise graphitic and psammo-pelitic types.

Charnockites of Gebel Moya are largely represented by acidic types. In handspecimen, these rocks exhibit the features typical of the acid charnockites from the southern Sudan viz. an overall olive-brown appearance with a vitreous or almost greasy lustre. They are coarse- to medium-grained, relatively hard, massive rocks with no gneissic or banding structure. Coarse-grained charnockites with porphyritic crystals of orthoclase are not uncommon; less frequent are large bluish quartz grains noticeable in some specimens. In others the olive-brown colour is so uniform that the feldspars and quartz are not easily distinguished on a fresh surface. Microscopically the charnockites of Gebel Moya (7711, 7716) are shown to consist of moderately strained quartz crystals which are notably large in some examples (reaching up to 6.0 mm. across), potash feldspar, plagioclase with a composition in the oligoclase range, ortho- and clino-pyroxenes and biotite. The orthopyroxene is moderately pleochroic hypersthene. Biotite is in excess of hypersthene. Iron ores, apatite and zircon are accessories.

ORIGIN OF THE SUDAN CHARNOCKITES

The field-relations, the macroscopic features and the petrographic characters of the examined charnockites and their associated country rocks permit conclusions as to the origin of these charnockites.

The regional distribution of the charnockites so far recorded in the Sudan clearly shows that these rocks are invariably associated with and occasionally include interbanded metasediments with lithological and textural similarities, an evidence which lent weight to the view of a metasedimentary origin for these charnockites.

The presence of some charnockitic rocks as garnetiferous hypersthene-biotite gneisses among other country gneisses seem to support the view that these charnockites are largely metamorphic rocks and would appear to have crystallized under conditions of relatively high pressure and temperature approximating to the pyroxene-granulite sub-facies of regional metamorphism.

The view now questioned is whether these charnockitic rocks have been formed by the progressive metamorphism of pre-existing rocks of lower grade or else that the charnockites have undergone a series of retrogressive changes which have converted them to charnockitic biotite gneisses and ultimately to non-charnockitic rocks. Petrographic evidence seem to support retrogressive metamorphism as responsible for the formation of charnockites and their derivatives such as the garnetiferous hypersthene—biotite gneisses.

There is, however, the possibility of an igneous origin for some charnockitic rocks of the Sudan particularly the coarse-grained and porphyritic acid types which occur as patches in the mass of Gebel Moya. These might have formed by some kind of segregation and re-crystallization of pre-existing charnockite material. It is also likely that the large mass of the Gebel presumably of intrusive character have formed in a similar way but in addition might have suffered palingenesis.

Although there is, as yet, no direct evidence for this the fact that such « magmatic» charnockites have not so far been found in the southern Sudan suggest that the conditions favouring remelting, slow cooling never existed there. It seems as if the presence of « intrusive» charnockites is governed by environmental conditions rather than by the existence of a charnockite magma.

The following mineral sequence is seen to have taken place in the course of the evolution of the Sudan charnockites : clinopyroxene —— orthopyroxene ——hornblende ——biotite.

A similar evolutionary history has been traced in charnockites from Australia (Wilson, 1952) and Ceylon (Cooray, 1962).

SUMMARY AND CONCLUSIONS

A series of Pre-Cambrian basement rocks are recorded in the Blue Nile and the southern provinces of the Sudan which can be matched with the charnockite series of Madras, India. These rocks appear to exhibit all possible gradations from the ultrabasic « pyroxenite» types through the basic and the intermediate members to the acidic rocks. The acidic charnockites are represented by enderbites with dominant plagioclase, by normal charnockites and by garnetiferous charnockites.

All the charnockites studied show signs of having suffered various degrees of strain and would appear to have crystallized under conditions of relatively high pressure and temperature approximating to the pyroxene-granulite sub-facies of regional metamorphism.

The Sudan charnockites differ from those from Madras in that the potash feldspar of the Sudan rocks hardly ever show microcline twinning.

It is argued that the charnockites of southern Sudan have originated from sediments judging by the invariable association with metasediments and possibly by retrogressive metamorphism. Some charnockites, particularly those of Gebel Moya might represent « magmatic» charnockites subsequently metamorphosed.

ACKNOWLEDGEMENT

The writer wishes to express his deep gratitude to Professor N. M. Shukri, Head of the Department of Geology, Cairo University for a critical reading of the paper and for valuable remarks.

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THE LAURA OF NAQLÛN

BY

OTTO F. A. MEINARDUS

The following study of the Laura of Naqlûn is the result of several visits to the Monastery of St. Gabriel (Dair al-Naqlûn or Dair Abû Khashab(ah)) and the Naqlûn mountain-range in the south-eastern part of the Fayyûm Oasis. In view of the renewed interest in early Coptic monastic life, both, within the Coptic Church [1] as well as by archaeologists and historians, this report will present additional evidence of a particular form of early Coptic monasticism. The Laura of Naqlûn, which probably existed from the beginning of the ivth century until the middle of the viith century, was in many ways typical of an early form of monastic life that prevailed in many parts of Egypt [2] and in Palestine. The material is arranged in three chapters, and includes a brief historical survey, a typological study of the caves of the laura, and a description of the Monastery and Church of St. Gabriel.

I. — HISTORICAL NOTES ON THE LAURA OF NAQLÛN.

Our knowledge of the historical development of the monastic life in and around the Oasis of the Fayyûm [3] is rather limited, especially if we should compare it with the rich history of such prominent monastic

(1) MEINARDUS, O., «The Hermits of Wâdî Rayân», *Studia Orientalia Christiana, Collectanea,* XI, 1966, pp. 293-318.

(2) *E. g.* the laurae east of Dair Abû Hinnis, al-Barsha, and near Meir, in Thebes and west of Esna.

(3) ABBOTT, Nabia, *The Monasteries of the Fayyûm.* Chicago, 1937, pp. 22-66.

centres as Nitria, Cellia, Scetis [1] or the Eastern Desert [2]. And yet, there are sufficient data available, which, if joined together, help us to establish a rough historical outline for our understanding of the Laura of Naqlûn.

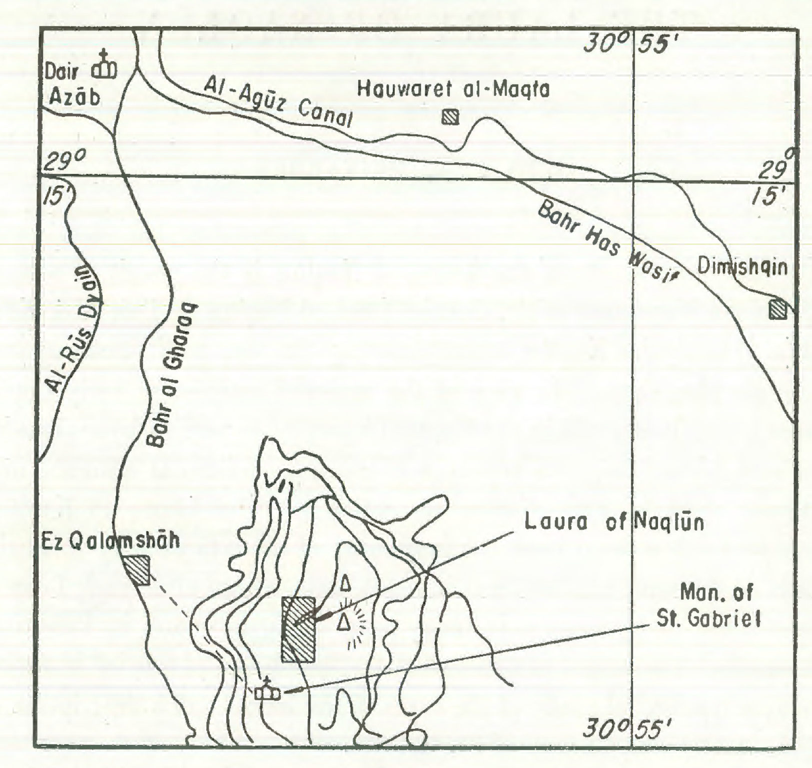


Fig. 1.

By the middle of the IIIrd century, Christianity was well established in the Fayyûm. Eusebius mentioned a Bishop Nepos of the Fayyûm, who in the first half of the IIIrd century was well-known for his millenarian interpretation of the Holy Scriptures [3]. During the Diocletian persecution, the Christian community in the Fayyûm was as much affected

[1] Cf. Evelyn White, H. G., *The Monasteries of the Wâdî 'n-Naṭrûn*. New York, 1932, 1933, vols. II, III.

[2] Cf. Meinardus, O., *Monks and Monasteries of the Egyptian Deserts*. Cairo, 1961, pp. 31-88.

[3] Cruse, C. F., *The Ecclesiastical History of Eusebius Pamphilius*. London, 1851, pp. 279-280.

as those Christians living in the other regions of Egypt, and the *Synaxaria* commemorate the names of several Fayyûm martyrs. Among these, there were two couples of Medinet al-Fayyûm, Theophilus and Patricia [1], and Bartholomew and his wife [2]. With respect to the Laura of Naqlûn, we know of the name of at least one monk, who settled « in the mountain south of Fayyûm». Abba Kâw, a monk of a cell near his native city of Bimâî [3], suffered martyrdom during the Diocletian persecution. Compelled to worship the idols, Abba Kâw not only defied the order, but also broke the idol in two. He was tortured and taken to al-Bahnasa, and finally imprisoned at Anṣanâ (Antinoë) where he was executed. Some five to eight hundred Christians suffered martyrdom with him. His body was translated to his cell at Bimâî, where a church was erected over it in his honour [4]. Another desert father of the Fayyûm was Abba Stephen Falâsî, who was known as a fighter « seeking after the manner of the saints who were in the desert» [5].

After twenty years of anchoritic life, St. Antony the Great is said to have gone to the Fayyûm, where he made monks of many of the Christian brethren, who were there, confirming them in the Law of God [6]. By the beginning of the IVth century, monasticism in the Fayyûm was as much developed as in the Nile Valley and in other centres.

The foundation of the Laura of Naqlûn is intimately connected with the fantastic Coptic story of Aûr or Aurâ, the illegitimate son of the queen's daughter and Abrâshît the magician [7]. Throughout this story,

[1] Budge, E. A. W., *The Book of the Saints of the Ethiopian Church*. Cambridge, 1928, vol. I, p. 263.

[2] Budge, E. A. W., *op. cit.*, I, p. 167.

[3] Bimâî was not far from the city of Fayyûm, cf. Amélineau E., *La géographie de l'Egypte à l'époque Copte*. Paris, 1893, p. 101.

[4] Amélineau, E., *Les actes des martyrs de l'église Copte*. Paris, 1890, pp. 69-71. Budge, E. A. W., II, p. 559.

[5] Budge, E. A. W., *op. cit.*, II, p. 563.

[6] Synax., *Patr. Orient.*, XI, p. 663. Budge, E. A. W., *op. cit.*, II, p. 533.

[7] The Coptic version of this story is translated by Budge, E. A. W., *Egyptian Tales and Romances*. London, 1931, pp. 12, 29, 247-263. The Arabic version is translated by Amélineau, E., *Contes et romans de l'Egypte Chrétienne*. Paris, 1888, vol. I, pp. 109-143.

the Angel Gabriel appears as the guardian and guide of Aûr, who finally was led to the Mountain of Naqlûn, where he built a church in honour of St. Gabriel. Later, the small church of sun-dried bricks was replaced with a larger and more pretentious one of baked bricks, and the new church was consecrated by Abba Isaac, the Bishop of the Fayyûm, who also ordained Aûr to the priesthood. On the death of the bishop, the people of the Fayyûm requested the patriarch to consecrate Aûr to be their bishop. The request was granted, but Aûr returned to the Mountain of Naqlûn, building « habitations for large numbers of monks and cells for the brethren, and houses for the use of the people who went there on pilgrimage»[1]. The consecration of the Church of St. Gabriel in the Desert of the Fayyûm is commemorated by the Coptic and Ethiopian churches[2]. An unsupported statement by B. T. A. Evetts mentions that Bishop Aûr, the founder of the Naqlûn Monastery, lived in the beginning of the ivth century[3].

Quite apart from the account of the *Synaxaria* and the Coptic legends, there exists archaeological evidence, which points to a Christian settlement at Naqlûn in the beginning of the ivth century. The inscription of a funerary stele in the Church of St. Gabriel, which was photographed and published by Johann Georg, Duke of Saxony[4], was deciphered by Prof. Sprengling with the assistance of Mr. P. C. Costas and reads : «Christ Lord, grant rest to the soul of thy servant Christodorus. He fell asleep on the 25th of the month of Pharmuthi, viiith indiction»[5].

From the ivth to the vith century, the Monastery of Naqlûn appears as the leading monastic centre in the Fayyûm, and it is into this period, therefore, that we must place the translation of the relics of Abba Kâw from his native city of Bimâî to the Monastery of Naqlûn.

(1) For a study on Aûr, cf. ABBOTT, N., *op. cit.,* pp. 30-32.

(2) On the 26th of Baû'ûnâh (Coptic) and the 26th of Sanê (Ethiopian).

(3) EVETTS, B. T. A., *The Churches and Monasteries of Egypt and some neighbouring countries attributed to Abû Sâlih the Armenian.* Oxford, 1895, p. 203, n. 3.

(4) JOHANN GEORG, *Neue Streifzüge durch die Kirchen und Klöster Ägyptens.* Berlin, 1930, p. 19.

(5) This could be either 304-305 or 319 A. D., cf. ABBOTT, N., *op. cit.,* p. 50, n. 101.

With the emergence of the Monastery at al-Qalamûn[1] under the dynamic leadership of St. Samuel, the Monastery of Naqlûn was pushed gradually but steadily into the background. On the approach of Cyrus, St. Samuel, who had stayed for three and a half years at Naqlûn, persuaded the inhabitants of Naqlûn, being two hundred lay members and one hundred and twenty monks, to escape and to flee to the mountains. After the release of St. Samuel from his captivity by the Byzantines, he set about the establishment of his monastery at al-Qalamûn, and two years later, the group consisted of forty-one monks, fourteen of whom had come from the Monastery of Naqlûn. Thus, from the middle of the viith century onwards, the Monastery at al-Qalamûn began to surpass the Monastery of Naqlûn in importance and position[2]. We know little about the history of the Monastery of Naqlûn after the time of St. Samuel. A document of the year 947 A.D. informs us that the monastery was the recipient of a fair-sized property located at Buljusuk and deeded to it as a gift by Tûsânâh, the daughter of Bisantî[3]. A further reference to this monastery is found in a letter written by a certain deacon Macrobius to Macarius, another deacon, who seems to have been left alone at Naqlûn[4]. Abbott suggests that since the Monastery of Naqlûn was deserted except for Macrobius, and reference to building or rebuilding is made in the letter, the document may well be assigned to the post-Hâkim period of restoration, *i.e.* the first part of the xith century[5].

Abû'l-Makarim's report (xiiith century) speaks of two churches. « This monastery contains a church named after the Angel Michael, in which there is a pillar of marble[6], which sweats as if water were flowing from it[7], and it also possesses a large keep, which overlooks

(1) MEINARDUS, O., *op. cit.,* pp. 307-336.

(2) ABBOTT, N., *op. cit.,* pp. 39-40.

(3) ABBOTT, N., *op. cit.,* pp. 12-15.

(4) CRUM, W. E., *Catalogue of the Coptic Manuscripts in the British Museum.* London, 1905, p. 281, No. 590. (This manuscript is undated).

(5) ABBOTT, N., *op. cit.,* p. 47.

(6) On my first visit to the Monastery of St. Gabriel (1962) I found several fragments of marble to the east of the present enclosure of the monastery.

(7) Whereas Abû'l-Makarim noticed the sweating marble pillar, the *Ethiopian*

a mountain, on which there is a bolder. Adjacent to the monastery there is a church named after the Angel Gabriel, enclosed with a wall, which was erected before the church was begun... It is said that the mountain called Naqlûn is that which contained the place where Jacob, son of Isaac, son of Abraham, enjoyed the shade, and worshipped; and sacrifices were offered to God in the days of Joseph, the son of Jacob, when Joseph superintended the building of the Fayyûm and the Hajar al-Lahûn» [1]. The *Ethiopian Synaxarium* informs us that « at the present day» the body of Abba Kâw is at the Monastery of Naqlûn. This means, that between the latter part of the xiith century and the beginning of the xvth century the Monastery of Naqlûn was not just one of several monasteries in the Fayyûm, but also contained the relics of one of the most foremost martyrs of the Oasis [2]. By the middle of the xvth century, however, the importance of the monastery had declined. Maqrîzî omits any reference to the Church of St. Michael, and merely speaks of the Monastery of al-Khashabah or the Monastery of the Angel Gabriel, which stands under a hollow in the mountain. « This hollow is known among them by the name of Jacob's shade. They state that Jacob, when he came to Egypt, sought shade within it. The water for this monastery is drawn from the canal of al-Manhî, and it lies below the Monastery of Sadmant [3]. At the festival celebrated in this monastery, the Christians of the Fayyûm and other places assemble» [4].

On the 19th of August 1672 Johann Michael Wansleben visited the Fayyûm and found the Monastery of Naqlûn almost completely ruined,

Synaxarium speaks of the wood of the roof of the church sweating during the offering and thus indicating the inundation of the Nile. If there was to be abundance that year, many drops of water would drop from it, but if there was to be hunger, the water would appear on it only in the form of sweat. Budge, E. A. W., *The Book of the Saints of the Ethiopian Church,* vol. IV, p. 1035.

[1] Evetts, B. T. A., *op. cit.,* pp. 205-206.

[2] Budge, E. A. W., *op. cit.,* II, p. 559.

[3] Meinardus, O., *Christian Egypt Ancient and Modern.* Cairo, 1965, p. 334.

[4] Evetts, B. T. A., *Account of the Monasteries and Churches of the Christians of Egypt, forming the concluding sections of the Khiṭaṭ of al-Maḳrîzî* (1441 *A. D.*). Oxford, 1895, p. 313.

though its two churches (presumably SS. Michael and Gabriel) seem to have been still standing. One church, probably the Church of St. Michael, Wansleben could not enter, because the monks used it as a storage-place for their provisions. The Church of St. Gabriel he describes as being very beautiful, all painted within with pictures of stories of the Holy Scriptures, and having the nave supported by slender columns of several stone-drums each [1].

The other travellers from the xviith to the xixth century did not mention the Monastery of Naqlûn. Somers Clarke in his survey of Coptic churches lists for the diocese of Fayyûm and Gîzah the « Deir el-Melak» [2]. In the beginning of this century, probably during the episcopacy of Anbâ Abrââm of the Fayyûm [3], the church was rebuilt and redecorated. The remains of the ancient wall-paintings were covered with a coat of oil-paint, and the wooden roof was restored. In the winter of 1927-1928 Johann Georg, Duke of Saxony, visited the Monastery of Naqlûn, and provided us with the first account after the rebuilding of the church. « The church appears just like any other church. The entrance is through a donkey-stable, which to this day is being used as such. Thus one enters a very interesting church, belonging to the viith century approximately. Noteworthy are the capitals in the nave and in the haikals, which give the appearance of being Corinthian. The lectern, which may date to the xiith century, is especially beautiful. Of interest also is the wooden ceiling» [4].

To-day (1968), the Church of St. Gabriel in the Monastery of Naqlûn is a regular parish church belonging to the diocese of the Fayyûm with the priest residing in Ez. Qalamshâh. Services are not regularly held. At the time of the annual mûlid in honour of St. Gabriel large numbers of Coptic pilgrims from the Fayyûm and Benî Suef assemble at the

[1] Vansleb, J. M., *Nouvelle Relation en forme de journal d'un voyage fait en Egypte en* 1672 *et* 1673. Paris, 1677, pp. 274-275.

[2] Clarke, Somers, *Christian Antiquities in the Nile Valley.* Oxford, 1912, p. 205.

[3] For a biographical statement of this famous bishop, who died in 1914 and is buried in the new Church of St. Mercurius, Dair al-Azab, Fayyûm, cf. Leeder, S. H., *Modern Sons of the Pharaohs.* London, 1918.

[4] Johann Georg, *op. cit.,* p. 19.

Monastery of Naqlûn and inhabit the many dwelling-places around the church, which were built for this purpose [1].

2. – THE CAVES OF NAQLÛN.

Whereas the monastic churches of SS. Michael and Gabriel are attested by manuscript evidence, there exists only one indirect reference to the existence of the Laura of Naqlûn. The story of Aûr contains a prophecy, which throws some light upon the form of monastic life at Naqlûn. St. Gabriel addressing Aûr says : « Peace be to thee, O Aûr, friend of God ! I testify that I am pleased with thy noble work... But I say unto thee, this place is a desert, and those who come hither will wish for what is necessary to satisfy their needs. Send none away, neither rich nor poor ... Many marvellous things shall be performed in this church, and its fame shall be noised abroad in all the countries of the earth... This mountain shall prosper, and shall become as crowded as a dovecot by reason of the immense multitudes of people who shall come to visit it from all countries of the earth, and their prayers shall mount up to God» [2].

The archaeological evidence points unquestionably to a laura, which consisted of a significant number of individual cells in the form of caves south-east of the Monastery of Naqlûn. Whereas, some monks lived within the walls of the monastery, others inhabited the caves and visited the monastery only once a week for the Weekly Assembly and the celebration of the Divine Liturgy. The only traveller, who noticed and also investigated these caves, was Wansleben. Apparently, the caves were not filled up with sand, for he did not mention any difficulties in entering the caves. « One sees on the mountain, which is behind the monastery on the south side and touching it, the ruins of an ancient small tower, which, the Copts say, was inhabited by the Patriarch Jacob, and it is for this reason, that its ruins are still called to-day Modsellet [3]

[1] This mûlid is already mentioned by Maqrîzî, cf. p. 178, n. 4.
[2] Budge, E. A. W., *Egyptian Tales and Romances.* London, 1931, p. 261.
[3] *I. e.* maẓallat.

Jacob or the Tabernacle of Jacob [1]. Going up a little on the same sandy mountain, one finds several caves, in which formerly hermits lived. I entered some to satisfy my curiosity. They are very small and there is nothing extraordinary in them» [2].

These caves are situated on the western slope and in the wâdîs of the north-western section of the Naqlûn mountain range. They are hewn out of a shaley limestone, and most of them are to be found just below the summit of the ridge. The openings of the majority of the caves face the west, though the openings of some of them face the south, and those

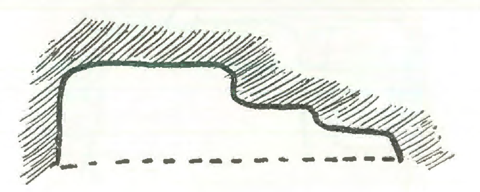


Fig. 2.

hidden in the wâdîs have their openings towards the south-east. On the western slope alone I counted fourteen caves, of which, however, only twelve were clearly discernible. Except for three caves, all caves are filled to various degrees with sand. The extent of the area from the northernmost to the southernmost cave amounts to approximately 500 m. Four additional caves are situated on the slopes of the ridges, which run parallel to the main western ridge.

By comparing the ground-plans of the caves of Naqlûn, we can distinguish three different types. The walls of all caves are fully or partially covered with plaster. I did not discover any ancient graffiti or wall-paintings.

Type A : The unfinished caves, which probably represent the latest attempts of cave construction. Their ground-plans vary depending on their stage of construction, but essentially they represent the first or the second stage of hewing. The back-walls of these caves are covered with a layer of plaster. The caves II, III and X belong to this type (Fig. 2).

[1] The foundations of the walls of this tower are still visible on the elevation south-east of the enclosure of the monastery.
[2] Vansleb, J. M., *op. cit.*, p. 277.

Type B : The one-room cave with a northern extension, probably the sleeping-room. The size of this room varies from 175×175 cm. to 250×250 cm. As in the case of the caves of type A, the walls are covered with a layer of plaster. Moreover, we find one or two niches in one or two of the side-walls of the main-room. These niches, which are a typical feature of the caves of Naqlûn, could have been used either for setting up an icon or for the storage of manuscripts. The niches have an average height of 70 cm. and a width at the base varying from 70 to 100 cm.

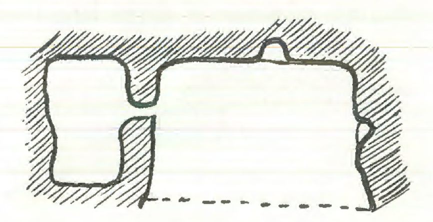


Fig. 3.

Whereas the main-room of these caves is normally filled with sand, the same does not pertain to the sleeping-room, which has a height varying from 160-180 cm. The caves I, IV, VI, XII, XIII, XIV, XV and XVI belong to this type (Fig. 3) [1].

Type C : The two-room cave with an outer and an inner room, both of which have one, two or three niches. The walls are plastered, and the size of the inner room varies between 12 m^3 and 20 m^3. The two rooms are separated by a natural wall, through which one or two openings lead from the outer to the inner room. As in the case of the caves of type B, the inner room has the ground-plan of a square. Whereas the outer rooms are filled with sand, the inner rooms permit one to stand comfortably. The caves V, VII, VIII, IX, and XI belong to this type. Cave XI is the only one, in which both rooms are not filled with sand, and we can assume that the other caves of this type resemble this cave if excavated. A large number of recent Arabic graffiti point to the fact that this cave is still being used as a temporary living-quarter

(1) Cave XV is noteworthy because its south-western wall has been washed away. This gives the appearance of a natural tunnel through the mountain.

by the Coptic pilgrims to the annual mûlid of St. Gabriel at the Monastery of Naqlûn. The walls are covered with two layers of plaster. A narrow passage leads from the outer room to the inner room, in which we find two niches, one of which appears to have been used for liturgical purposes (Fig. 4).

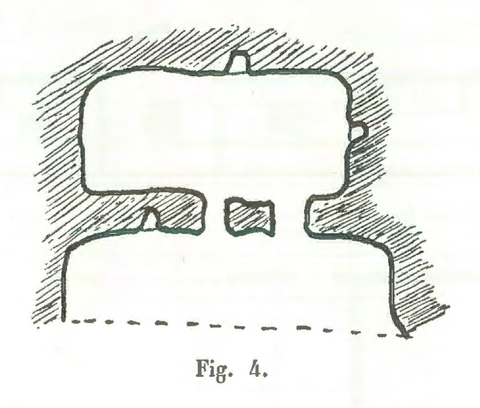


Fig. 4.

3. — THE CHURCH OF ST. GABRIEL.

The Church of St. Gabriel has three haikals, the central one is dedicated to the Archangel, the other two are dedicated to St. George and the Holy Virgin. Wooden screens with wicker-design divide the church from the east to the west into four sections : the haikals, the choir, the section for the faithful and the narthex. Another wooden screen, also with a wicker-design, separates the northern aisle, which is used as a gynaikion. In the nave there are six columns, three on either side, with Corinthian capitals. As pointed out by Johann Georg, the church is noteworthy because of the numerous Corinthian capitals, which have been built into the walls of the church. Thus, we find two capitals built into the fabric of the outside wall on either side of the entrance to the vestibule of the church ; three capitals are found above and on either side of the entrance leading from the vestibule to the church. Inside the church, capitals were built into the north-wall of the nave, and into the southern section of the wall separating the choir. In the southern part of the apse there are two capitals, and in the centre of the apse there is inserted a stone with a cross surrounded by a band

with an inscription. The design around the cross is made up of small crosses. Undoubtedly, these capitals belonged to the two former churches of SS. Michael and Gabriel.

The mandatum tank, which is sunk in the floor, is situated in the south-western part of the nave [1]. The wooden ceiling is noteworthy

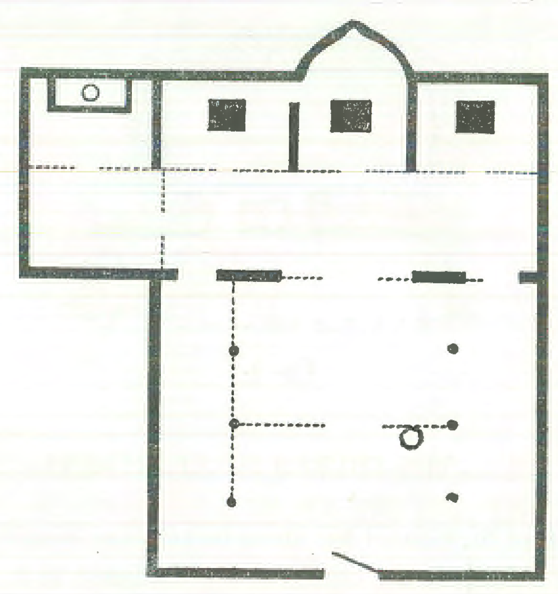


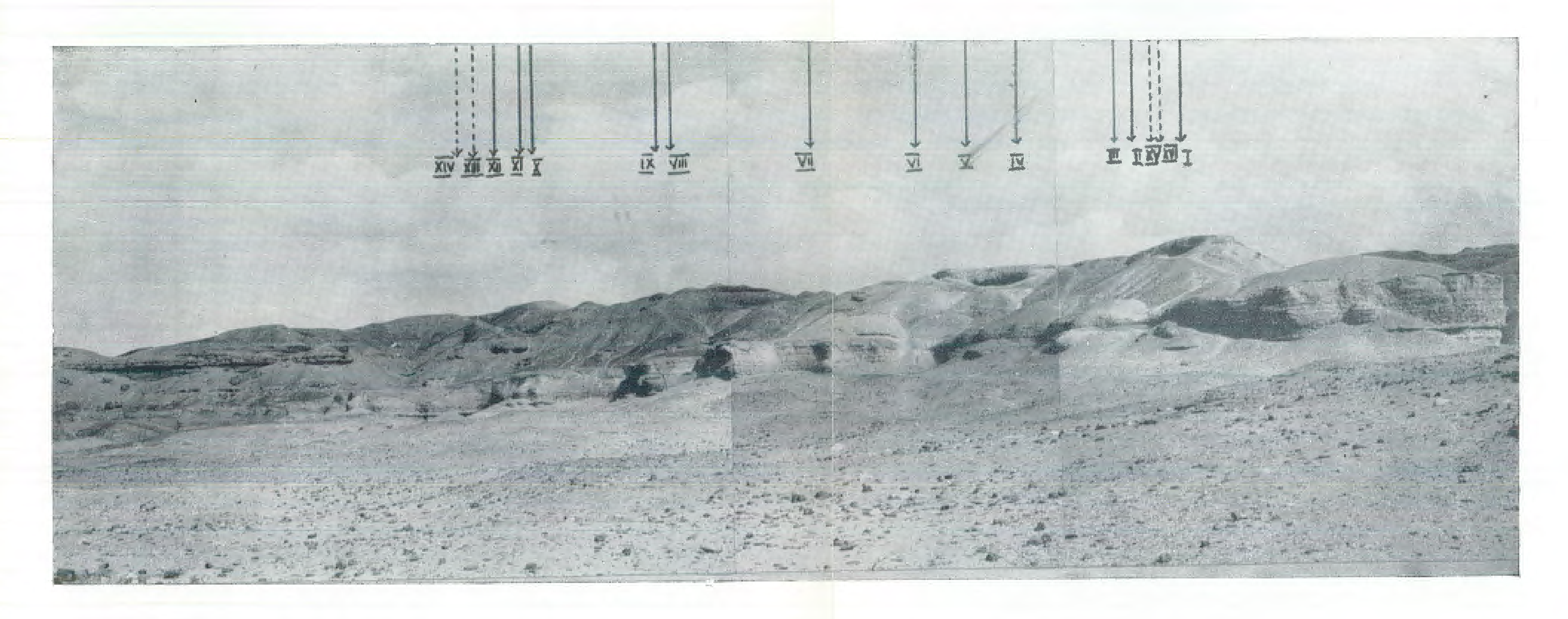
Fig. 5. Church of St. Gabriel, Monastery of Naqlûn.

for its paintings of geometrical designs. On some boards we find Coptic letters. The screens are adorned with the following icons : Jerusalem proskynitarion (beginning of the XIXth century), the Holy Virgin enthroned with Child and two attending angels (XVIIIth century), the Archangel Michael (XVIIIth century), the Entombment of Christ (XVIIIth century) and the Entrance into Jerusalem (XIXth century). In addition, there are the following modern pictures : The Blessed Heart of the Virgin, the Archangel Gabriel, the Archangel Michael, the Good Shepherd, the Annunciation and the Sacred Heart of Jesus (Fig. 5).

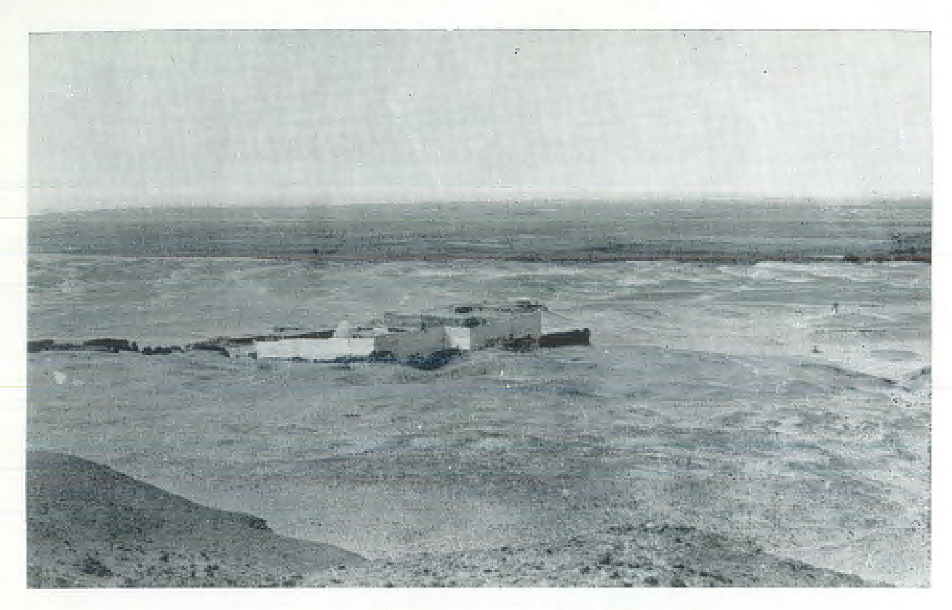
[1] The use of this tank is for the service of the foot-washing on Maundy Thursday and on the feast of SS. Peter and Paul and for the service of the Blessing of the Water on the feast of Epiphany. BURMESTER, O. H. E. KHS.-, *The Egyptian or Coptic Church.* Cairo, 1967, p. 21.

From the architectural evidence of the present church we may surmise that it was largely rebuilt and completely redecorated during the latter part of the XIXth or the beginning of the XXth century, though with construction material of the two former churches at Naqlûn.

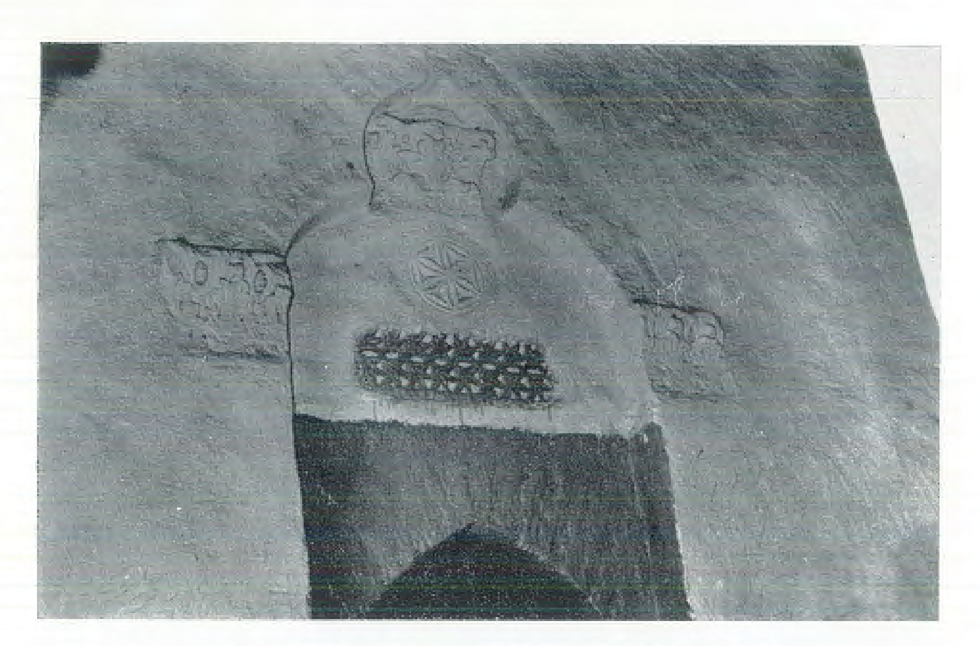
The walls of the inner and outer courts of the ancient monastery are still discernible. Remains of the cells with their respective niches can be seen from the roof of the Church of St. Gabriel. The small houses in the south-western part of the monastery, and those inside the monastery south of the church as well as the small chalet west of the church are used by the pilgrims to the mûlid of St. Gabriel. The date of the construction of these houses ought to be assigned to the same period as the reconstruction of the church.



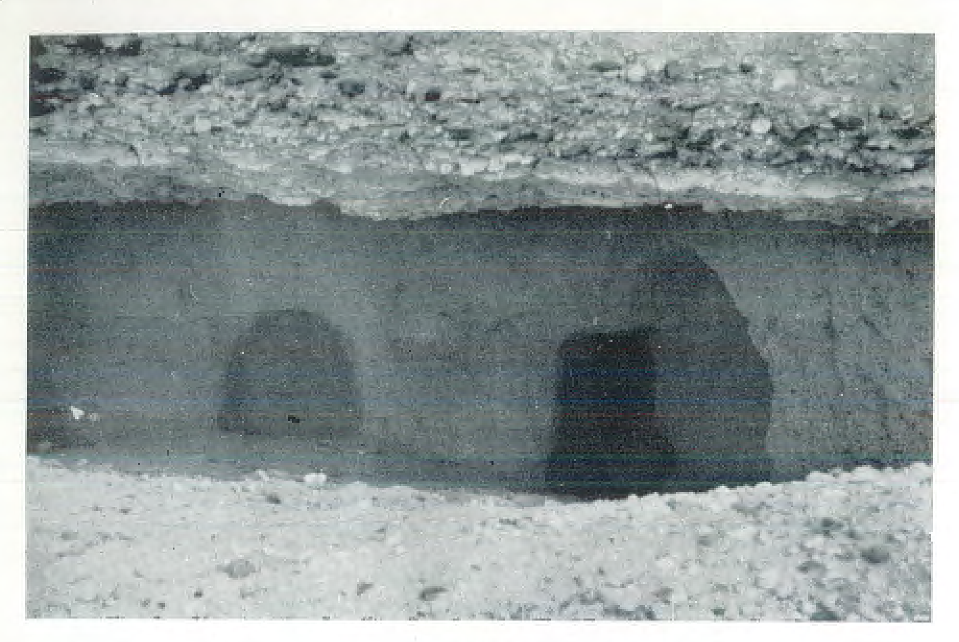
Northern Ridge, Naqlûn Mountains.



A. — The Monastery of Naqlûn.



B. — Entrance to the Church of St. Gabriel.



A. — Cave IX.



B. — Caves X and XI.



A. — The Ruins of the Ancient Monastery of Naqlûn.



B. — Cave XV with its Western Wall washed away.

MARKAZ QALIOUB
AND EL-QANÂTIR EL-KHAIRIYA
A CONTRIBUTION TO THE STUDY OF LAND-USE IN THE NILE DELTA

BY

NASR EL-SAYED NASR

The content of this paper is a contribution to what the writer has previously written about the use of the land in the Nile Delta [1]. It gives the results of three conducted field work terms in Qalioub in the Spring of the years 1964, 1965, 1967 with the purpose of investigating into the agricultural geography of part of the Nile Delta. The investigation took the form, first, of a detailed land-use survey of chosen parts of Qalioub and, second, of the subsequent cartographical analysis of data collected during the course of investigation. This paper also makes great use of the distinguished work carried out in the Area by Gaafar during the period 1962/1964 [2], and the unpublished reports on soil survey carried out by the Ministry of Agriculture during 1965 and 1966 for Qalioub and El-Qanâtir el-Khairiya [3].

The investigation showed that the general picture of the area is not much different from that arrived at through its preceding investigation in Ashmoun in 1950. The whole area is in arable cultivation with special

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[1] Nasr El-Sayed Nasr, « A sample study of land use in the Nile Delta », *Geography* No. 189, Vol. XL, Part 3, July 1955.

[2] Gaafar, M. H., « The Qalioub Area », A study in Agricultural Geography. An unpublished M. A. Thesis, presented to Ein Shams University 1965-1966.

[3] Ministry of Agriculture (1965-1966). Detailed Soil Survey and Classification of Qalioub and El-Qanâtir el-Khairiya Districts, Qalioubia Province. Reports No. 137 and 144, Dept. of Survey. (In Arabic).

interest in vegetable and fruit production to the effect that differenciation between types of land use has to be of individual crops. Further, a similar system of cropping is here practised—multi-cropping—more than one crop per year—with the result—as was encountered before—that land use mapping and classification into types has to take in consideration either different maps for different years or classification on the basis of a set of crops forming one rotation unit. In spite of that similarity between the two areas compared, points of dissimilarity could be distinguished. Qalioub being at an easier access to Cairo, the main consuming center, as well as affected by modern industry in Shoubra El-Kheima area has a rather different pattern of economy which will be revealed through the intensive investigation reported here.

The area covered (see Map) lies at the head of the Delta to the east of Damietta Nile branch and 5 kilometers down stream from Cairo, within latitudes 30°.8' and 30°.18' and longitudes 31°.5' and 31°.18'. It comprises 46,337 feddans (48,098 acres), and includes the farm lands of 34 villages. With that location, Qalioub benefited both from the transport network which connected Cairo with the rest of the Delta, and from Cairo itself — as a four million civic consuming center. Its location extends its effect also to the relief of the area, lying at the head of the Delta, hence at higher land level and commanding the irrigation system of the eastern Delta. The results are : lighter soils, easy irrigation with adequate water supply, and general inclination towards vegetable and fruit production especially in its western and southern localities [1]. These results led to high land sale values, higher rents, higher percentages of land held by large holders and consequently scores of holders absenteeship [2].

The terrain of Qalioub and El-Qanâtir el-Khairiya is that of flat deltaic country, sloping gently northwards and eastwards. The Damietta Branch and part of the river Nile itself, form its western and southern

[1] In 1964 Qalioubia Province, of which Markaz Qalioub is an administrative unit, ranked second only to Beheira in citrus production, both provinces being responsible for about 50% of the country's total production.

[2] This case diminished greatly, almost disappeared, after 1952.

boundaries separating Qalioub from Ashmoun, the area previously surveyed and referred to earlier in this paper, and Imbaba in Giza province. Its eastern boundary is an administrative boundary, separating Qalioub from El-Khanka and Shebin El-Qanâtir. From the north an administrative boundary separates Qalioub from Tôkh. The study of the contour map of the area reveals that the highest parts lie in the southwest and west adjacent to the river and Damietta Branch, and the lowest parts towards the central and northern parts. The difference in land level is between 18.50 metres in the southwest, Abu El-Gheit, and 14.50 metres in the northern extremities. These relief conditions resulted in easy water flow from south and southwest towards the north and east, and the existence of water logged areas mainly in the center and north. The area, however, could be adequately subdivided into four distinguished physiographic divisions, namely, the water channels of the Nile and Damietta Branch, the Nile ' islands', namely, Abu El-Gheit, and Shalaqân, the main land-(el'elo)-and ' Gezira ' lands, and finally, the turtle backs represented in Geziret El-Nagdi. The second and third divisions comprise the tracts agriculturally utilized.

The relief features, though insufficiently marked to be seen in the field, determine the framework of the irrigation and drainage systems in the area. The main irrigation channels (Fig. 1), with an intake from the Nile, as is usual with canal irrigation, keep to the inner flanks of the high grounds and the branch canals and distributaries lead from the main canals to carry water down slope. Up to 1940's not all the canals and distributaries were aligned efficiently, the result of which some change had to take place after that date, i. e. Iskander Canal and Kertamieh Canal had to be converted into drains, Iskander drain and Qalioubia drain. Slightly less than 90% of the area studied depends wholly on one irrigation system that of Abu El-Menagga, receiving its water directly from the Nile through a set of pumps with a total discharge of over 450 thousand cubic metres per annum. The rest of the area depends for its water either upon El-Bassouseya canal—5.5% of the whole area— or El-Rayah el-Tawfiki (main feeder) and Damietta Branch—7% of the total area of the land.

Irrigation distributaries carry water only during their irrigation turn 'Dor' in the rotation and from them water passes into the farmers' own canals—« masaqui»—which lead directly into the fields. Irrigation is

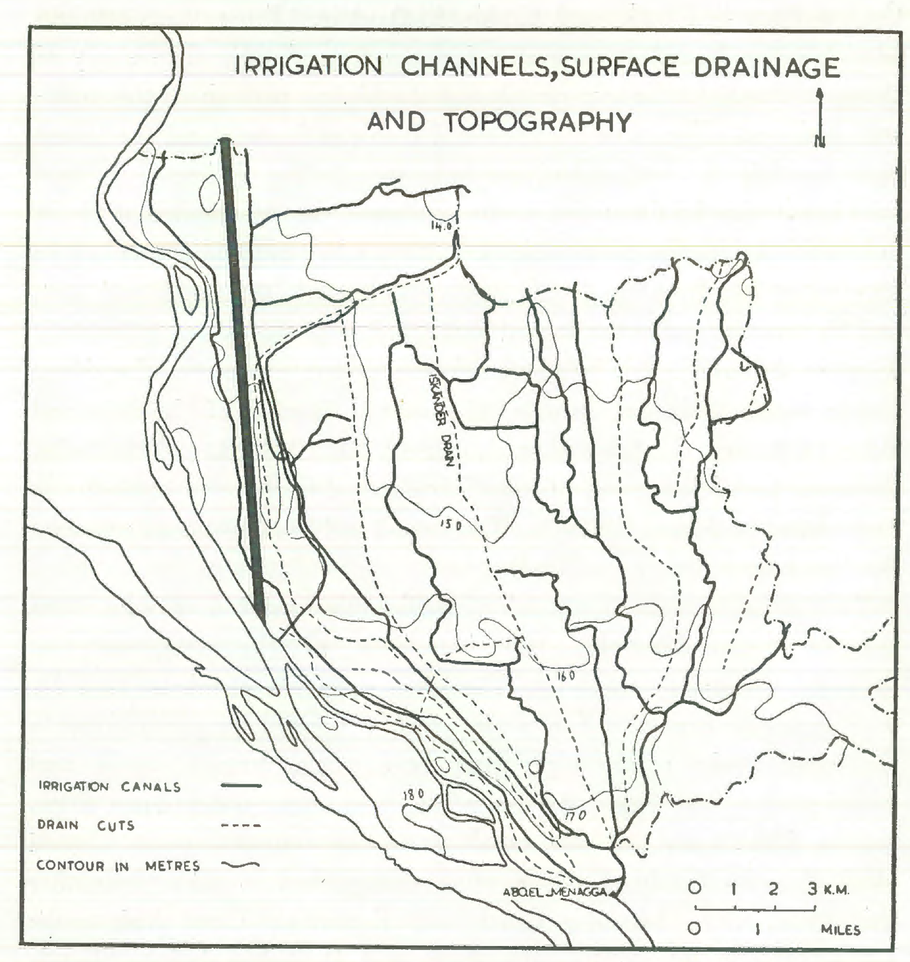


Fig. 1.

flush—« raha»—all the year through, except where lift is needed either for lands at high levels, i. e. Gezira lands, or towards the south of the area, or where vegetable and fruit cultivation—highly remunerative crops—can pay for lift expenses. Methods of water lift are varied. They differ with change in land level and size of holdings and consequently availability of capital. They range from the ordinary sakia—« haloufa»—

(water wheel) and the 'tambour' (Archimedean screw) to the centrifugal pumps, either artesian [1] or drawing Nile water.

Here as in Ashmoun an irrigation rotation system has been devised on the general principle of allowing water into the distributaries for a certain period, a number of days, which differ with different seasons : « nili» (flood season), « sefi» (summer season) and « shitwi» (winter season), and stopping it for another period, generally double the former. The former period, working, is known as « Imala» (work), the latter is known as « bitala» (stopping). The latter corresponds to the Indian (and Pakistani) word of « Tatil». The purpose of the rotation system is to ensure fair distribution and economical use of water, together with putting the farmer into the habit of employing only needed water amounts for different crops. The duration of turn « dor» varies with the seasons. During the summer—17th April up to 16th August—it is common for the working turn to be 6 days and the stopping period to last for double that period, 12 days. With the comming of the 'Nili' (flood season) 16th August up to 27th November—red silt ladden water is lead into the distributaries for 5 days, to be raised to 7, in September and October, and are stopped for another 10 days. The « shitwi» turn (winter season) —starting in late November up to mid March has a working turn of 6 days and stopping period of 12, excluding the period when canals are closed for cleaning ('El-Sadda el-Shitweya'—December to February). The Spring rotation « Rabiei»—March 17th—April 16th—allows a single watering every 15 days (5 days working and 10 days stopping). This system of seasonal variation could be changed when « private» well water is used or when vegetables, needing more frequent waterings, are grown. The areas served by El-Zeitoun and by Battah distributaries —both subdivisions of Abu El-Menagga—with 50% or more of their layout under vegetables receive a special rotation system, allowing for one day working amid the closing period to the effect that the maximum period of stopping must not exceed 5-7 days. Inspite of adequity of

[1] The word artesian here may not be the exact word, but it is locally and officially known as such. It means drawing underground water as different from that drawing surface resources either Nile or canal.

water supply and efficient system of water distribution some irrigation problems are encountered in tail areas of distributaries, especially Mazhar and Fadel distributaries in Tanan and El-Sidd villages and in Sanafir and Gannabiet El-Bassouseya distributaries in El-Barâdà and Sindbîs villages. However, the great irrigation problem is encountered in Gezira lands mainly found in Abu El-Gheiṭ and vicinity; the problem is a higher land level above local water level and general shortage of water supplies due to absence of distributaries [1].

The change from basin to perennial irrigation, together with water storage in front of the Delta Barrage, within easy seepage reach of the area, and wide vegetable cultivation, caused soil deterioration especially encountered in low level tracts. Open or cover drainage is practised as a treatment for such a condition. Fig. 1 shows the main drains in the Markaz. The alignment of main drains is generally efficient following the bottoms of low ground lying between canal tracks. Drainage efficiency, however, differs with locality to the effect that three different drainage zones could be referred to : efficiently drained lands, lying mainly to the west of the Markaz with an area of about one fifth of the whole area, second, less efficiently drained lands comprising over 40% of the whole area, lying mainly towards the east of it, and badly drained tracts of about 10% of the area lying mainly towards the center, south east and north west of the area. Covered drainage appears to be a necessity for the area as well as the whole of U. A. R. Shortage of cultivable land and the relatively high percentage of land wasted under open drains—about 10%—made that practice an imposing need. Covered drains, however are practised as yet only to the limited area of not more than 1,500 feddans mainly in the Sindbîs area.

During the field work conducted in the area, samples of the farmer's surface soil were taken and identified by inspection. Particulars concerning cropping, work ability, response to water irrigation, rent values and sale values, together with productivity were obtained from farmers for each sample. Only recently, an official soil survey of the eastern part of the area was terminated and as yet the report concerning the survey is unpublished, though consulted by the writer. Qalioub soils are by no

(1) Light soils may also be responsible since they need more water supplies.

means different from the general run of Egyptian soils as far as chemical composition is concerned : sufficient potash, declining phosphate contents, particularly in sub-soil, and shortage of nitrogen. Here the soluble salts range from 0.15% in sandy soils in El-Sidd village up to 0.26% in heavy soils in Kafr El-Turgumân and Tanân villages. These percentages, however, fall within normal limits for the country as a whole. Organic matter in the topsoil—30 cm.—does not exceed the 1.9% maximum which was found in Qalioub village. It can be as low as 0.7% encountered in El-Sidd village, mainly sandy soils. This resulted in the main manurial requirements being organic manure— «baladi», nitrates to furnish nitrogen and super-phosphate to arrest the phosphatic depletion. Similarly, Qalioub soils do not differ—mechanically—from other deltaic soils with coarse material decreasing from the Nile bank eastward. Soils with high percentages of fine materials lie in the center and north of the Markaz. These soils unless waterlogged—favour most field crops and therefore commands the highest rents, L.Eg. 25 up to L.Eg. 40 per feddan, taxes, and values. Light soils—mainly sands—lie next to the river 'Gezira' land and at the north east corner of the area where El-Nagdi sandy turtle-back exists. These lands are usually assessed at lower rent values— generally less than L.Eg. 10 per feddan— and follow a different cropping system from that of the fine material soils. The soil survey carried out by the soil Department of the Ministry of Agriculture, and referred to earlier, revealed that, mechanically speaking, the area can be divided into four main soil types (Fig. 2) :

a) Silty clay soils with fine material over 70% of which the clay fraction ranges from 55% to 65%, compact, brown or dark brown, heavy textured with a deep profile (one metre) and having slow water conductivity.

b) Silty clay loam soils with fine material ranging from 50% to 70% of which the clay fraction ranges from 30% to 50%. Like its preceding type it is generally brown, heavy textured with a deep soil profile and slow conductivity.

c) Silty loam, still with a deep profile, brown soils, compact, medium textured with medium conductivity. The clay fraction and silt are less pronounced than in the previous soils.

d) Sandy soils with fine material content of 10% to 20%. The coarse material is more pronounced. These soils are poor in organic matter [1]. The farmer, however, has his own classification of soils. Soils in the

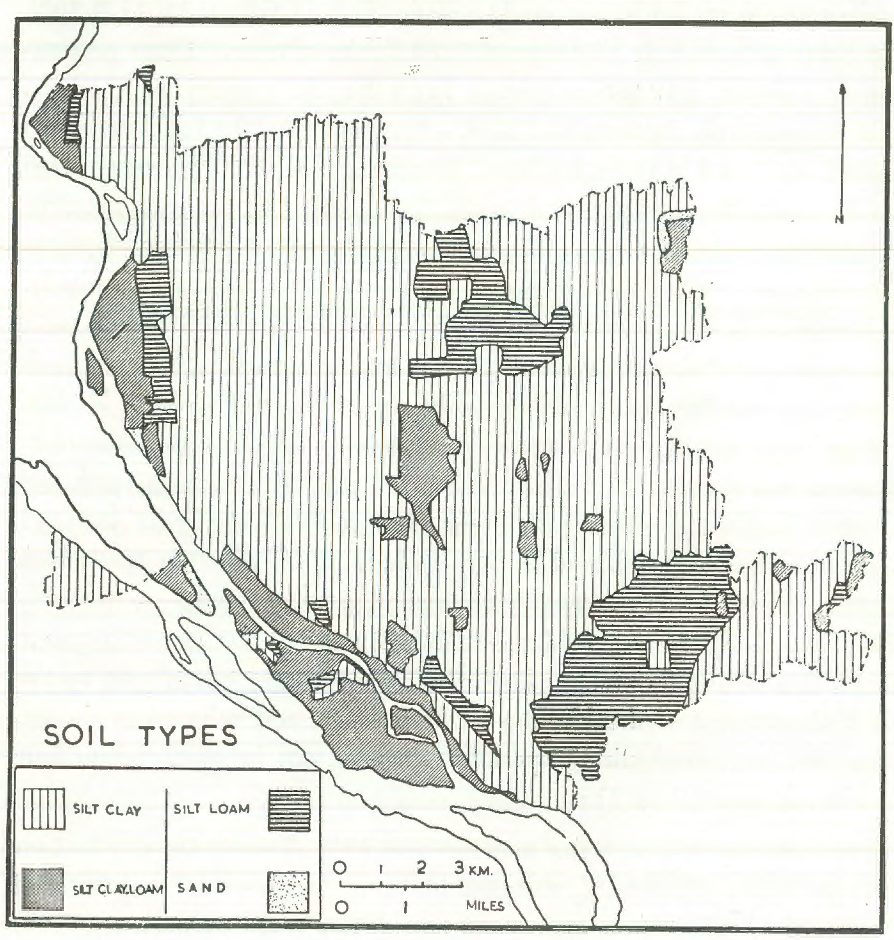


Fig. 2.

[1] Here are some samples of the above mentioned types (percentages) :

Locality	Clay	Silt	Fine Sand	Coarse Sand	Organic Matter
a) Kafr El-Turgumân	65.5	20.5	10.33	0.77	1.4
b) Qalioub	52.5	20.0	23.17	0.45	1.9
c) Mit Nama	27	17.5	29.69	1.29	1.0
d) El-Sidd	7	2	18.11	27.24	0.7

extreme north east of the area, at El-Sidd village, the north east of Tanan are his « ramllia» (sandy). Those of ' Gezira ' lands, « Gazaier», to the west of the area in Shubra Shihâb, El-Munîra, and Abu El-Gheit villages, together with soils lying at the extreme east of the Markaz are « Ard Safra» (light yellow soils). To these, heavy yellow soils which constitute most of the area, could be added under the same label. These may be compared with Pizer's types of sandy loam, silty loam and silty clay loam [1]. ' Ard Soda' means the black or heavy dark soils, equivalent to Pizer's type of clay and silty clay, mainly found in the center of the Markaz. Black alkalai — soils, with total area of over 500 feddans — encountered in Qalioub village, in the extreme north of Shalaqân village, south of Bahâda, north west of Nâi and Sindbîs are locally known as « Hāwār, Sormeit or Qarmout». To the farmer « ard ramllia» is not good except for certain crops such as water melons. « Ard Safra», both light and heavy, is most suitable for potatoes, other vegetables and banana, while fine soils « ard soda» heavy yellow soils favour cotton, where production reaches seven kantars or more per feddan [2]. In case of salty soils or alkalai soils, rice and barley are generally indicated.

The climatic conditions prevailing extend their effect upon production. The seasonal rythm of climate permits multi-cropping. More than one crop can be taken per year, other conditions being favourable. The main air temperature is normally above 12° C. or over 53° F. The mean maximum, however, may rise up to 36° C. or about 97° F. in July, while the mean minimum may fall as low as 6° C. or 43° F. in January. Extreme temperature recordings may rise up to 48° C. or fall as low as 0.0° C., the former recorded in a summer month while the latter was recorded in January. The seasonal temperature rythm is responsible for the division of the agricultural year into three distinguished but overlapping seasons; « shitwi» or winter season, from November to June, « sefi» or summer season, from February to October, and « nili» (flood season)

[1] Pizer, N. H. « The Practical application of knowledge of soils». Tech. Report « 8» M. A. F., U. K. 1962 (quoted by Gaafar).

[2] One metric kantar = 157 kilograms of unginned cotton and 50 kilograms of ginned cotton.

from July to October. With that agricultural calendar a varied crop rotation is practised with wheat, barley and clover as main winter crops « shitwi », cotton, rice, and summer maize as main summer crops, « sefi », and 'nili' maize as the main 'nili' crop [1]. Vegetables can be grown in the three seasons. Two crops per year are the most common practice. In the western and southern areas, however, more than two crops can be taken. These areas are either vegetable growing areas, with a short growing season, or more than one crop can be grown on the same plot at the same time. This double — or sometimes triple — cropping system is locally known as « tahmil », (one crop carrying another). With the falling or rising of temperature below or above what can be supported by plants the farmer has his own devices to keep a Winter crop warm or shade a Summer crop against the scorching sun. A straw cover, i. e. for tomatoes, a nurse crop, as is usually done with clover, a smoke blanket, or even seeding along the southern or western side of the ridge, as commonly practised with cotton, can be the suitable device. Wind effect has also to be taken into consideration. Wind break hedges of « Gazwarina » and 'Kafour' (Eucaliptus) trees are commonly encountered especially entouring large farms, orchards, and nurseries. The « Khamasin » — a scorching south wind — may cause the shrinkage of wheat seeds or the falling down of citrus flowers or even fruit. As high as 20 per cent of a certain farm crop of citrus was recorded by Gaafar, falling as a result of a Khamasin wave between May the 26th and June 11th. Waterings are also arranged in such an order as to avoid crop lodging as a result of blowing wind. Scantiness of Winter and Spring rains made it necessary to depend almost wholly on irrigation. The area with relatively high share of vegetable cultivation is easily affected by frost known locally as « Gleet » (ice) and heavy falling of temperature [2].

The pattern of land use is influenced both by physical as well as human controls. Location, relief of land, soils and climate have been referred

[1] Loosing importance recently owing to widespread of summer maize. Total area under summer maize for the whole country, lately, is more than three times that of Nili maize. Few years back the case was the reverse. Summer maize gives better yields provided summer water is available.

[2] During the last field work in Feb. 1967 crop damage of beans, tomatoes and bananas, was unanimously recorded in the area, following a severe cold spell.

to earlier, human controls, here, take the form of government intervention through national planning, land holding system, and widespread of industry within easy reach of the area. The sharp contrast in the size of land holdings, common to Egyptian agriculture before 1952, almost disappeared after that date as a result of the agrarian reform [1].

As a result of the increase of population — 228 thousand — between 1940's and 1960's of over 25%, as compared with a slight increase in land resources, among other causes, large and medium holdings disappeared, and a class of landless peasants came into existence, together with more fragmentation of land [2].

The number of land owners more than doubled. The average ownership fell from 4.4 feddan down to only 1.3 per owner. Examining an air photograph of the area will reveal the striking « mosaic » pattern of cropping as a result of excessive fragmentation. This condition, however, is disappearing under the new device of « Tagmei El-Zeraat » (gathering together of plots). A vast area of cotton cultivation appearing in the field, on maps, and air photographs, can be not more than a number of fragment plots practising « Tagmei » or as locally known « Dawra Zeraeya » (agricultural rotation). Another new terminology encountered in the area after 1952 is that of « Islah » which is given to land — over 6,000 feddans in all — confiscated by the government of large farms and managed either under official supervision or duly distributed among the farmers according to specific qualifications and follows a certain scheme in management. These lands cover wider areas in Abu El-Gheit, Bâsûs, Qalioub and Shalaqân. Agricultural cooperation covering both capital and agricultural services is another newcomer in the area [3]. Agricultural

[1] According to that reform personal ownership is limited to 100 feddans. Excess is to be disposed of. Rents, farm labour, wages, and other practices are also altered.

[2] Percentage of large ownerships—over 20 feddans— fell from 3% in the forties down to only one percent in the late fifties; the land they held fell from 54% to only 25%. Ownerships of 5-10 feddans fell in number from 7% to 2.3% while their area increased by over 1%. Ownerships of less than 1 feddan though unchanged in area rose in number from 50% of the total of ownerships up to 82.1%.

[3] These services include providing the farmers with machinery, manures, seeds, insecticides, marketing, etc.

Cooperatives—47 in the area—became a needed necessity after the new changes have taken place and the number of small holdres increased. Other official arrangements deal with crop areas—mainly cotton, being fixed at 30% of the area cultivated, irrigation and drainage arrangements, production, marketing and storing. Mechanization though increasing is still inadequate. A total of 164 units mainly tractors used for land ploughing and threshing is the full existing capacity of the area and exist mainly in the eastern and northern parts of the area especially in Kôm Ishfîn, Sindbîs, Balaqs, Tanân, Sindiyûn, Qalioub and Kafr Abu Gumʿa, villages. Vegetable cultivation in the south and west may be responsible for the few number of mechanical implements in these areas. The relativ-ely high percentage of leased land—as compared with the northern areas mainly cultivated by owner—« Ala El-Zemma», in the south may offer another explanation.

The normal or standard agricultural system in Qalioub follows the traditional three course rotation. One third of the land is put under a catch crop of clover « barseem tahreesh» in early winter and cotton for the rest of the year. A second third is put under wheat for winter crop and maize for the summer or flood seasons, the last third has clover or beans for winter crops and maize for nili. Shifting takes place from one third to another with the result that the same land can grow the main cotton crop once every three years. Rice or summer fallow is sometimes —especially on salty soils or on large farms, not interested in maize,— is a substitute for maize in the summer and flood seasons. Crop rotation varies, however, with variation in soil type and crop grown. The southern tracts of Qalioub, interested in vegetables—have their own crop rotation. Ordinary field crops, except clover, are commonly excluded and successive crops of vegetables follow one another. Three different crops can some-times be taken per year.

Wheat is the main winter cereal in the area. It occupies, normally slightly over 5,000 feddans. If compared with the whole of the province— —Qalioubia—Qalioub ranks fourth as far as wheat area is concerned and fifth as far as yield per feddan is concerned. The average yield per feddan is, however, above that of the country as a whole (8.68 ardebs of 150 kilogrammes each as compared with 7.3 for the whole of the country).

Wheat cultivation here is not much different from that practised in other parts of the country not omitting its neighbour, Ashmoun. Wheat is —winter-sown—mid November. It generally follows either maize or cotton of the preceding crop-year, preferably cotton, which allows more time for cultivation preparatory to sowing. In this case wheat is sown on the cotton ridges and that is the common practice in the area. Five waterings are sometimes given, four, however, is the normal course. The first and second waterings are given before the yearly winter closure of canals—December 31st to February 9th. The first is given 20 days after seeding, while the second a month later. After the re-opening of canals a third watering is given, while a fourth follows a month later. The main variety grown is « Toussoun». « Baladi 116» (native) and Giza 139 are also grown. Wheat here is by no means a highly remunerative crop. With a total input of about L. Eg. 30, one feddan under wheat yields less than L. Eg. 40. Hence, a low tempting crop that would not be grown was it not to abide with the decree insisting on wheat growing. Clover is another winter-sown crop being useful both as winter animal feed and seed production as well. It is a common practice too to grow a catch crop of clover before the land is prepared for cotton. In this case one or two cuts for fodder could be taken before the sward is turned under to act as a green manure for the cotton crop. The normal practice is, however, that four to five cuts are taken before the land is prepared for maize or any other summer or flood crop. Clover is either grazed by tethered beasts or cut to be carried to sheds, or sold off the farm as far as Cairo. Clover being cut or grazed the land is irrigated and left for about forty days for clover to grow again. Winter onions make another important crop in Qalioub. They are not extensively grown elsewhere in the province and exceeds in area that of beans and barley, other winter sown crops. Qalioub is not famed for yield per feddan of beans or barley. Within the province it ranks fourth for beans and fifth for barley. Garlic is another important winter crop. Qalioub ranks first in area under garlic—in the province—but third in yield per feddan.

Of the summer season crops, « sefi», cotton is by far the most important occupying more than 7,000 feddans or over 40% of the total summer area, followed by maize—32%. Other summer crops are vegetables and

rice. As far as area is concerned Qalioub ranks third —within the province— being preceded by Toukh and Benha. As far as yield is concerned—6.57 metric kantars per feddan—the Markaz ranks third and is above the average yield for the province and for the country as a whole. In spite of vegetables playing a big part as cash crops, cotton is still the main cash crop, being sold wholly outside of Qalioub. Lately cotton growing is giving way, especially in the southern and south western parts (Fig. 3), under the continuous and steady pressure of vegetables. The variety grown varies from year to year, but within the medium long staple varieties' range. Giza 47 is the most common. Cotton requires rich soils which need to be deeply ploughed, levelled and then thrown into ridges running preferably—E. W. Seeds are dibbled in by hand on the southern side of the ridge and most commonly covered with a hand full of sand. If ridged N. S. seeds are dibbled in on the western side of the ridge to obtain the maximum warmth. Late February and early March is the most suitable date for sowing. Cotton receives ten waterings varying in intensity with the progress of growth, being light when the plant is shallow rooted. The manuring of cotton is, both, by farm yard manure and nitrogenous which is applied mainly in the form of soda nitrate, and in most cases directly to the plant itself « Takbeesh». September and October is the time for picking. The total cost of production per feddan exceeds L. Eg. 57, labour cost being responsible for one third [1]. Other items of input are picking, insects combat, manuring and watering. Cooperative marketing of cotton is in practice in the area since 1963 [2].

Rice is the third important summer crop as far as area is concerned but second as a cash crop. It occupies generally about three thousand

[1] An output of L. Eg. 110 per feddan of cotton is common in the area.

[2] This practice includes : picking-dates fixed, farmers receive a picking loan and picking canvas sacks with the farmer's name on. When picked and put in sacks cotton is weighed, recorded and stored in « Shonas». The grade is assessed by a team of three and price is fixed. The whole produce of a village is collected; then transported to be ginned and marketed. Such a practice eliminated middlemen and consequently ensured higher incomes for the farmer. Delayed cash which was the main complaint of the practice is being solved lately.

feddans. Qalioub has the largest rice area in whole province—over 40%. This may be due to availability of water on the one hand and previous existence of large holders on the other. Salty and inferior soils may also be a cause. The eastern soils have no rice. Area increases eastwards

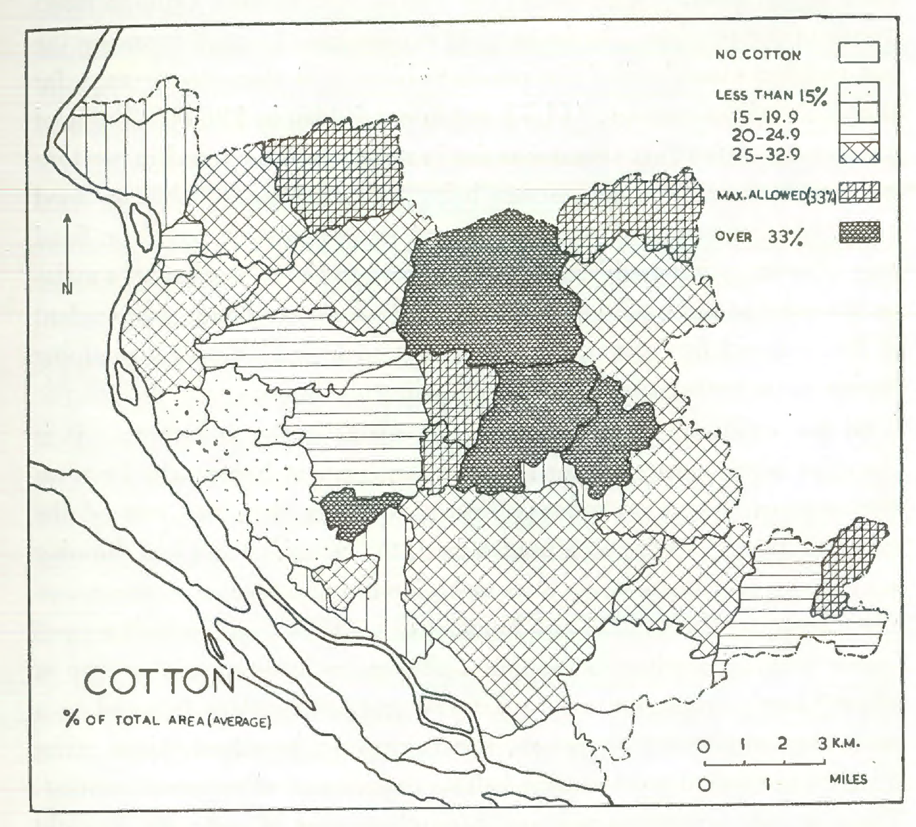


Fig. 3.

and mainly on inferior soils [1]. As far as yield per feddan, however, Qalioub ranks third in the province with 2.98 « dariba» per feddan (one dariba equals 950 kilogrammes). Rice receives some 18 to 20 waterings at 5 to 7 days intervals. The manuring of rice is mainly phosphatic and nitrogenous. El-Nahda, or El-Montakhab 47 (selected)

[1] Hallâba and El-Sabbâh village, with about 80% of its lands included in the official soil report as third class soils, have the highest rice area percentage.

is the main variety grown, covering 75% of the rice area. With an average input of over L. Eg. 30 one feddan of rice may yield over L. Eg. 52.

Summer maize is the second summer crop as far as area is concerned. Nili or flood maize is still more important though giving way lately to the Summer crop. With an area of over 5,000 feddans Qalioub ranks fourth in the province. As far as yield is concerned Qalioub is among the low yielding 'marakez' of the province, lower still than the average for the whole of the country, (11.73 ardab per feddan in 1964). The land use pattern shows that summer maize is relatively widespread in western and southern villages, the former being « Gezira» lands liable to flood inundation, or rising of water table and consequently a 'nili' or flood crop of maize is impossible, the latter, nearer to Cairo, marketing « maize on the cob» or selling it 'green' as is locally known. Being independent of Nile seasonal fluctuation, and depending on Abu El-Menagga pumping station made water available for early maize cultivation.

Of the « nili» or flood season, « nili» maize is the main crop. It is the chief bread corn consumed on the farm, wheat being sold for town consumption though at a lower rate in Qalioub than the rest of the country. Beside serving as a human feed, the thinnings and leaf thinning « Tawreek» are fed to stock, thus make for the shortage of summer and 'nili' forrage. Maize either as a Summer or a « nili» crop is mainly a small farmer crop. According to rotation « nili» maize follows a winter crop of wheat 'Baq', clover, or beans 'Barayeb' and is commonly followed by a catch crop of clover than cotton, less commonly, by wheat, since maize deprives the soil of not less than half its organic and nitrogenous content. The clay soils favour maize more than other types of soil. Six to eight waterings is the common practice. Mid July is the common period for « nili» maize cultivation, which normally awaits the arrival of flood water, generally between the 10th and 20th of July, a case which will disappear after the high dam will be completed and water supply is constant all the year through. By late November the crop is ready for harvest. Different from cotton and wheat, maize variety is not officially controlled « Americani Badri» (early American), Nab El-Gamal (Camel Tooth) and « Hageen» (hybreed) are the main varieties grown. The land use pattern shows that the extreme northern, especially north west, and

eastern villages have relatively high percentage of land under « nili» maize. A belt of rather salty soils extending from El-Qanâtir el-Khairiya the (Delta Barrage) eastwards to Tanan, and an entouring south fringe of vegetable—interested—villages have lower proportions of their lands under maize (17% in Hallâba as compared with 53% in Qaranfîl in the north). Yield per feddan is below the average level of the province and for the country as a whole (5.8 ardeb per feddan). Relatively high yields come from eastern and southern localities. Nili maize is not a high remunerative crop. Output rarely exceeds input if rent and labour cost, which is generally offered by the farmer and his family, are included. Summer maize, however, with higher yields per feddan is more remunerative. This case will exist no more after the expansion of summer maize, with a steady supply of water adequate for all summer crops, a procedure progressing at a wide pace.

Different from Ashmoun, production of vegetables for sale [1] is not necessarily a large holding business, may be for being nearer to Cairo within reach for the common farmer cart used as a means of transport. Vegetable production does not follow the common strict crop rotations referred to earlier since the same kind of vegetables can be grown in the three different seasons, though not on the same plot. The term « Erwa» is commonly applied for the growing period « erwa sefi, shitwi, or nili». The sandy and light soils are employed mainly for vegetable crops. This practice is common to other parts of the country as well as other parts of the world. In Qalioub the western and southern areas carry a high percentage of the vegetable crop (Fig. 4). They also benefit of their easy access to Cairo. Vegetables occupy something like 10% of the crop area (the average for the country is 5.5%). Compared with the Qalioubia province, Qalioub, with only 21% of the total area, has 34% of the vegetable area of the province. The main « shitwi» (winter) vegetables—covering 40% of the total area under vegetables—

[1] Vegetables are also grown for farm consumption either in small allotments or « tahmil» (a secondary crop on the same land under a major crop). Examples are tomatoes, cucumber, and onions on cotton ridges and « Meloukheya» in « nili» maize fields.

are peas, beat, carrots, cawliflowers, « kolqas» (yam) and winter potatoes. « Sefi» or summer vegetables—45% of total area under vegetable—comprises egg—plant, ' Bamiah' (ladies finger), sweet potatoes and summer potatoes. « Nili» vegetables with only 15% of the total area

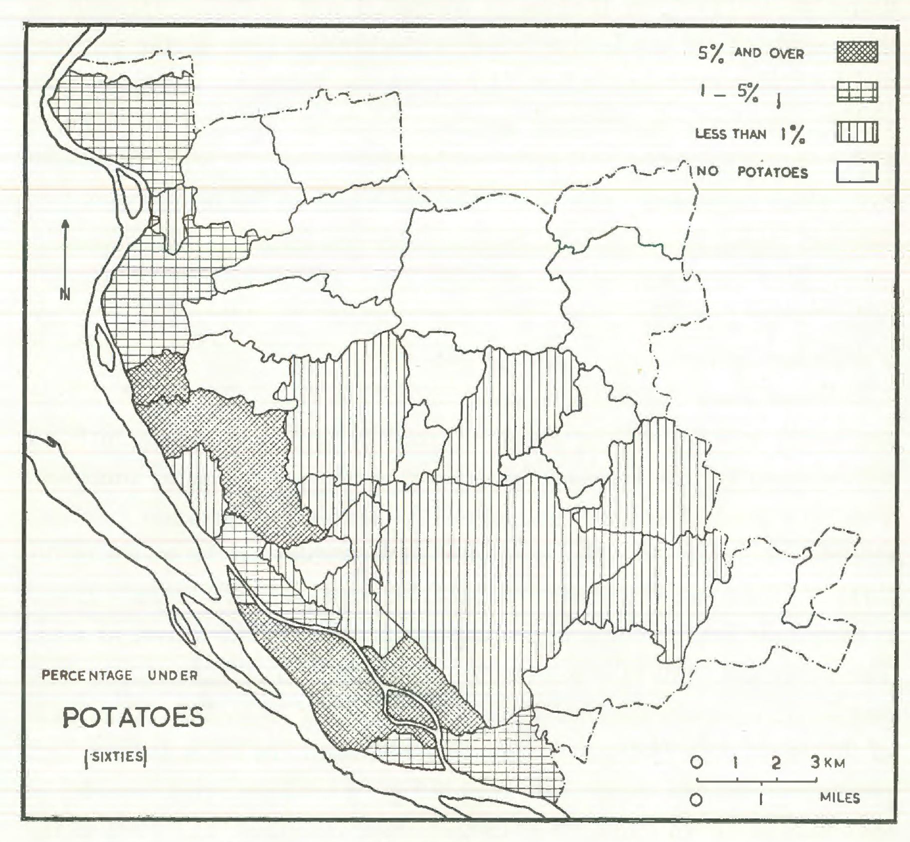


Fig. 4.

of vegetables include marrow, garlic, « nili» tomatoes, and ' nili' potatoes. On the whole, tomatoes, potatoes and « Makat» (melon group) make the main vegetables grown here being responsible for over 70% of the total area under vegetable. Tomatoes cover over one third of the area under vegetables and is mainly a winter crop (52% of the total) in spite of the low yield of the winter crop if compared with the « sefi» or nili crops. (3.5 tons per feddan as compared with 6 and 5.6 tons for nili and « sefi» respectively). Local high selling prices for winter tomatoes

make for the difference in yield. The winter crop is also meant for export at a time when tomatoes are short especially in Western Europe. The western and southern villages of Abu El-Gheit, Bassous and Mit Nama have higher yields per feddan [1].

« Makat» (melon group) is the second important vegetable as far as area is concerned. Over one third of the province's crop is grown here, « Shammam» (melon) is responsible for more than half of the area, followed by « batteekh» (water-melon) cucumber and others. These are mainly summer crops—March or April— and are mainly found on « Gezira» lands west of the Nile embankment. « Baali» or unwatered crop is the common practice. Pigeon dung is the main manure applied. The south west and extreme northwest is the homeland for « Makat». Abu El-Gheit has over 32% of its layout devoted to that crop or 60% of the « sefi» area. One feddan of « Makat» can yield a net profit of L. Eg. 200. Potatoes thrive best and give higher yields on « Gezira» lands and light soils lying here in the west, especially in Abu El-Gheit and Shalaqân (Fig. 4). Qalioub is almost without rival in potatoes' production in eastern Delta (except for Talkha in later years). The Summer crop starts as early as December, while the nili crop may be as late as August. The area under « nili» crop is more than double the Summer crop. The yield, however, is higher in case of the latter, being 8.4 tons per feddan as compared with 7.1 for the « nili» crop [2]. A net value added of L. Eg. 76 per feddan can be achieved.

Similar to vegetables, fruit trees are also grown on sand and light soils, though by no means confined to them or be in an ideal habitat on them.

The western parts show considerable interest in fruit growing. El-Qanâtir el-Khairiya (The Delta Barrage) and Shalqân with 20% of their lands under fruit trees, Shoubra Shihab and Kafr El-Hiwâla with a slightly lower percentage rank among the first fruit growing areas. Other tree

[1] A new practice using a special variety of « creeping tomatoes may yield up to 20 tons per feddan at a total cost of L. Eg. 300 which is six times the prevailing cost when ordinary practices are followed. A difference in output of L. Eg. 500 per feddan can be achieved with application of the new practice.

[2] Yields of 9 tons per feddan were recorded in Sayed Galal farm and in other farms in Abu El-Gheit.

patches are scattered all over the markaz. Fruit growing, more than vegetable growing, is a larger holder enterprise. A small farmer cannot afford his land to earn no income for the number of years needed for the fruit tree to bear fruit. Capital and skill are also lacking. Land for clover, as stock feed, and for maize, as human feed, leaves not much room for other crops. The fruits grown in Qalioub are citrus—mainly oranges—with over 70% of the total area under fruit, and bananas covering about 20%. Vines and Mangoes come next. The largest single citrus orchard exists in Shalqân, the largest areas under citrus, however, exist in El-Baradaa, El-Qanâtir el-Khairiya (Delta Barrages), Balaqs, Zâwyet El-Naggâr; Sindbîs, Qaranfil, Ag-hour El-Sughra, Qalioub, Kafr Ramâda and Kôm Ishfîn. One feddan, of 160 trees, may consume up to L. Eg. 100 and yields L. Eg. 200 on the average. Cost and yield vary, however, with kind, intense of service and age of tree. Bananas, different from citrus trees, are more confined to the western and south western villages. Shubra Shihab and Bassous are responsible for 75% of the total area. Most of the rest is still on « Gezira» lands. The « Hindi» (Indian) is the main variety grown (65% of the total area under banana); « Maghrabi» is the second important. The number of trees per feddan varies from 600-900 according to variety, being more with the « Hindi». Yields vary from 600 to 1900 kilogrammes per feddan in the first producing year and rises up to 12,000 and 25,000 in the second and third years, when it begins to decrease. Southern plantations, in Bassous, give higher yields than in the north. The sum of L. Eg. 300 is a fair net profit per feddan. Limited « Gezira» area—most suitable for banana—in Qalioub may be one of the controls on the limited area under such a highly remunerative crop. Lack of capital — L. Eg. 260 per feddan—is another major handicap.

In conclusion, and to sum up, an attempt to classify land can be forwarded. The characteristics of soil profile, production, expenses, input, and crop yield were all considered in land classification [1]. Land is classified into six different categories (Fig. 5). The first four include agriculturally utilized lands with

[1] The official report on soil survey in Qalioub, p. 21 (Arabic).

grades one to four; the other two, of grades five and six, comprise agriculturally unproductive lands either for physical disabilities or being under water-

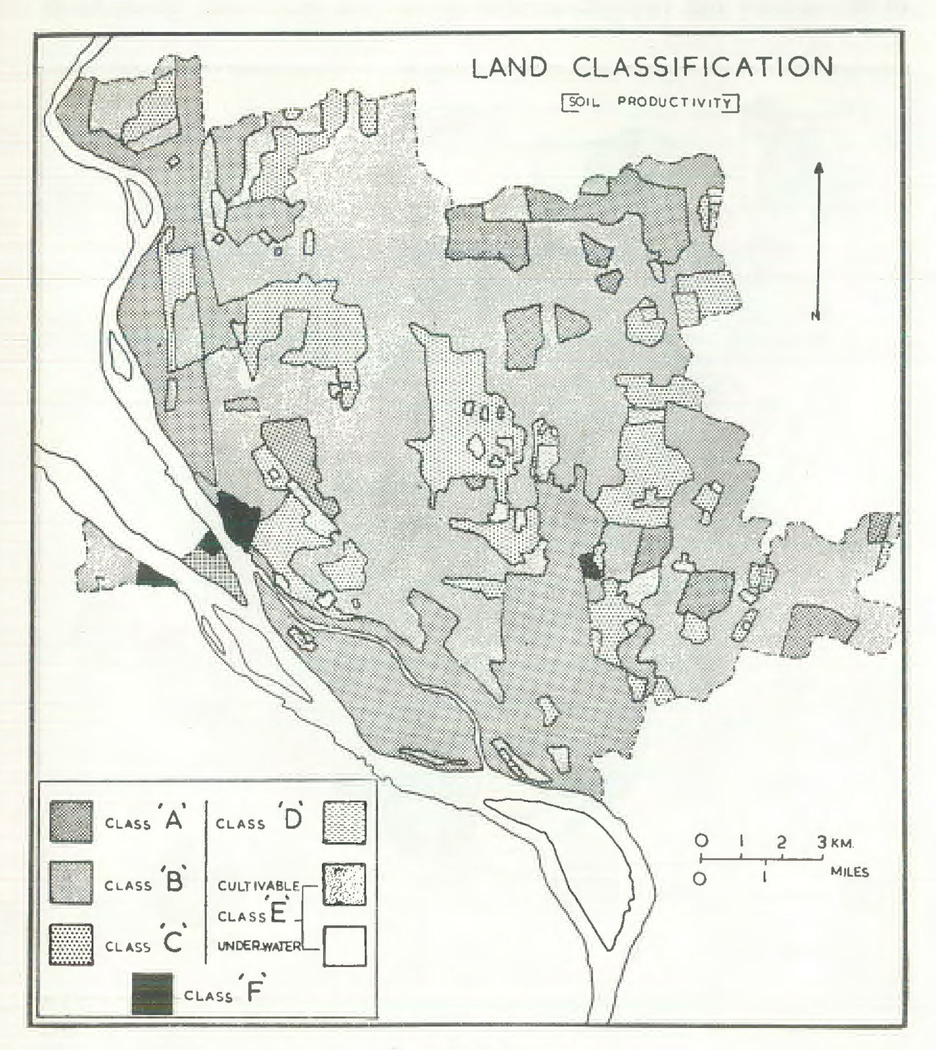


Fig. 5.

ponds, or dedicated to public utilities. The first four constitute slightly over 90% of the whole area surveyed. Class A lands occupies slightly over 20% of the total area of the Markaz. It constitutes 100% in Mit Nama Village and only 0.0% in Kafr Abu Gomaa, Kafr El-Turgumân, Nai and Sanafir villages (Fig. 6). Yields on these lands are above the

average for the whole country and present no agricultural problems. Second class lands—class B—still exceeds, in yield, the general average of the country but presents curable agricultural problems. These lands

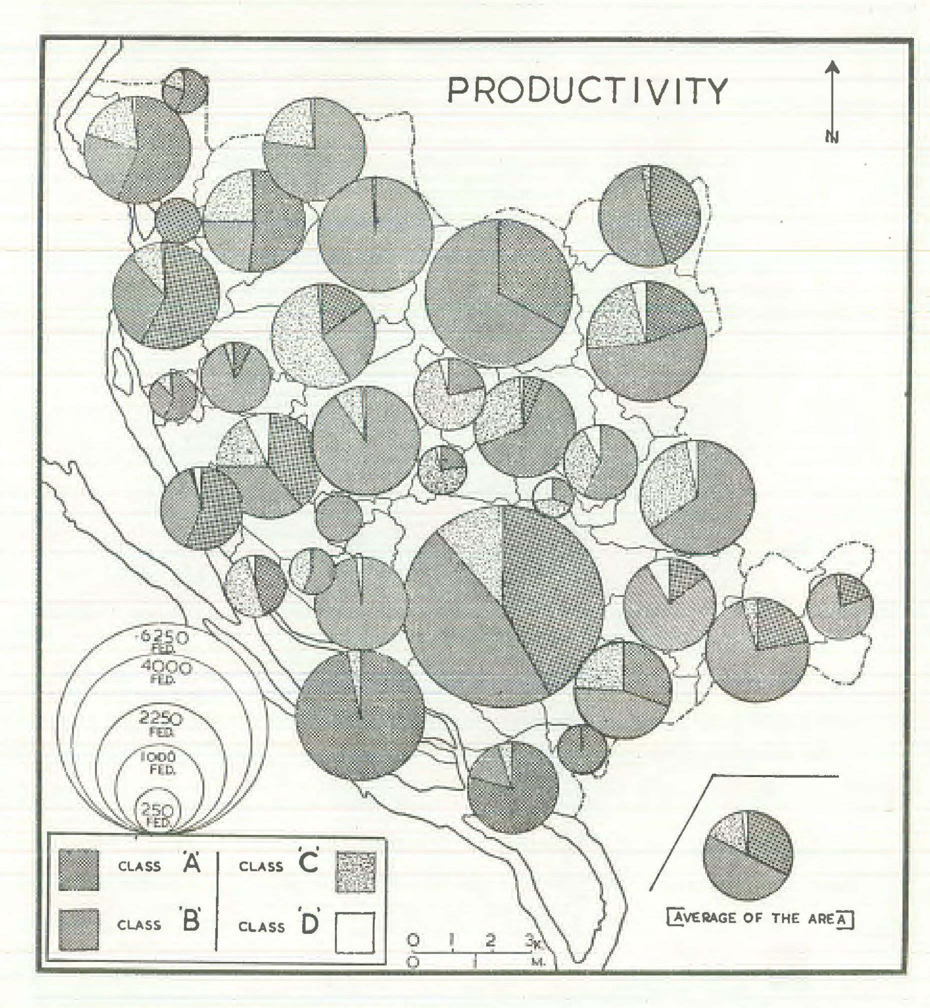


Fig. 6.

make over 53% of the Markaz area. Sanafir has over 90% of its lands in this category. Zawiet El-Naggar and Kom Ishfin reach the 80% figure. About three quarters of the Markaz lands are of first and second catagories. Third class lands—Class C—with a fair yield similar to the general average of the whole country, cover 14% of the total area.

El-Sabbah and associates have more than 75% of its lands in this category. The fourth category—Class D—covers only 2% of the lands. In Kafr Abu Gomaa, however, it reaches over 28%. The fifth and sixth categories are mainly encountered in El-Sadd, sandy lands of El-Nagdi

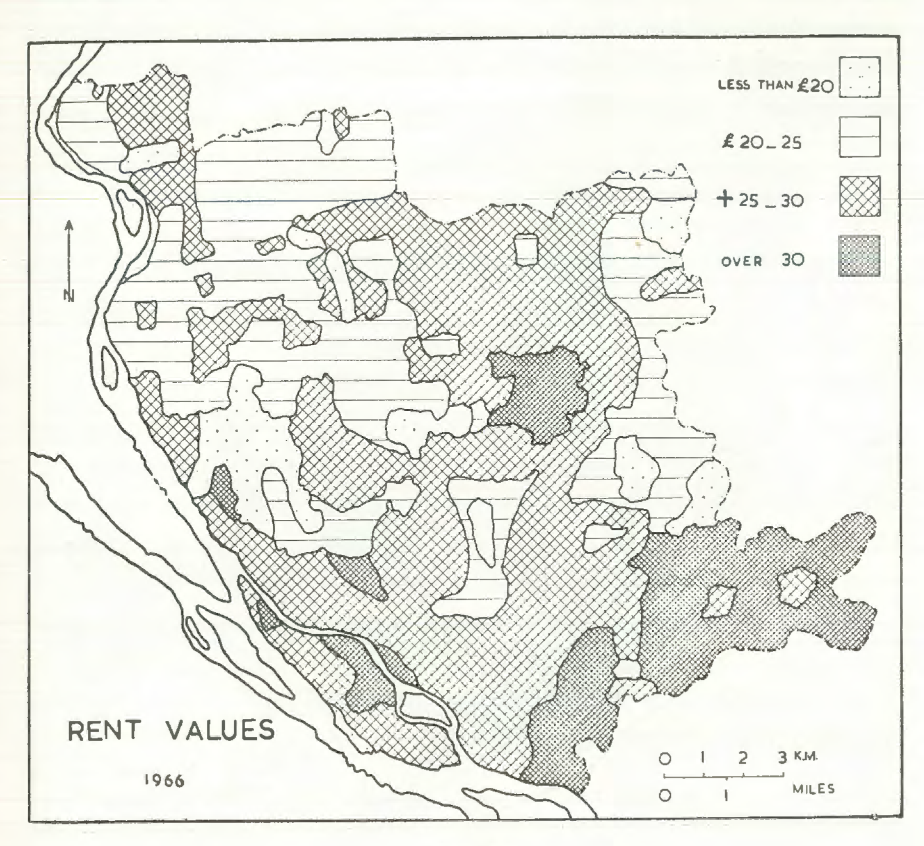


Fig. 7.

turtleback, Qalioub, Sindioun and Tanan. Particulars of rent may also help in assessing land value and consequently classification. According to rent values four categories can be distinguished (Fig. 7). First class land, with rent of over L. Eg. 30 per feddan, is mainly found in the south and south east, especially in the villages of Bassous, Mit Nama, Mit Halfa, Kom Ishfin, Balaqs, Zawyet El-Naggar and Qalama. Second class lands, with average rent of L.Eg. 25—L.Eg. 30 over most of the Markaz. Third class lands, mainly in the north and west corner of the Markaz and a narrow

fringe in the eastern villages, include Qaranfil, Aghour, Shubra Shihab, El-Munira, El-Baradaa, Nai, Tanan and El-Sidd villages. Rents here vary from L. Eg. 20-L. Eg. 25. The last category — fourth class lands, includes scattered plots in the center and the west of the Markaz. Most of North

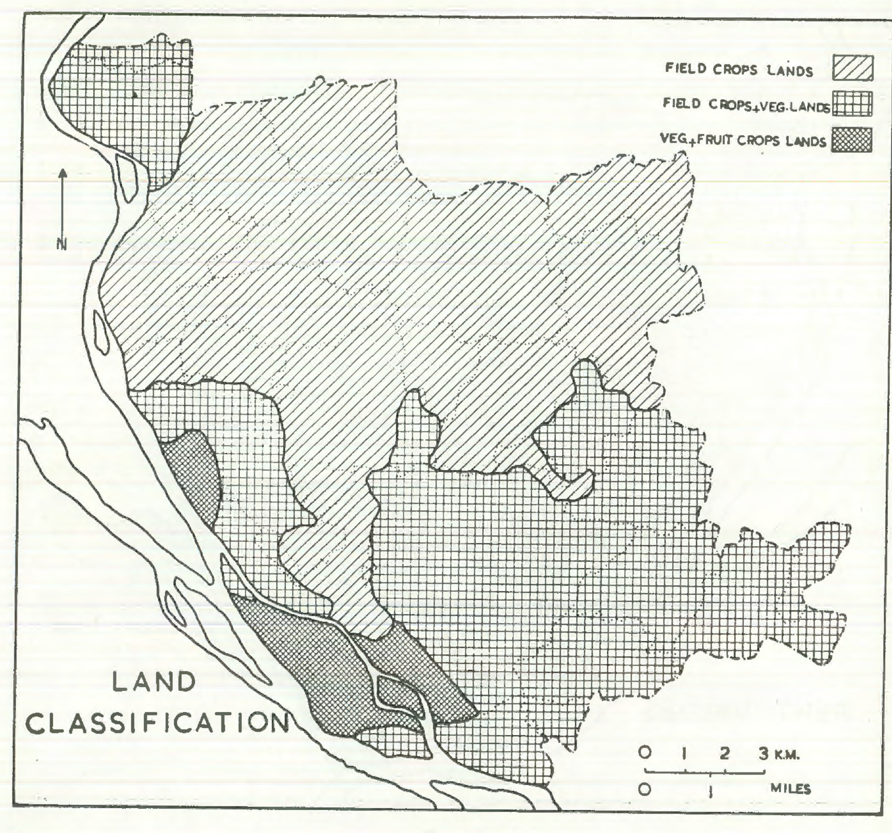
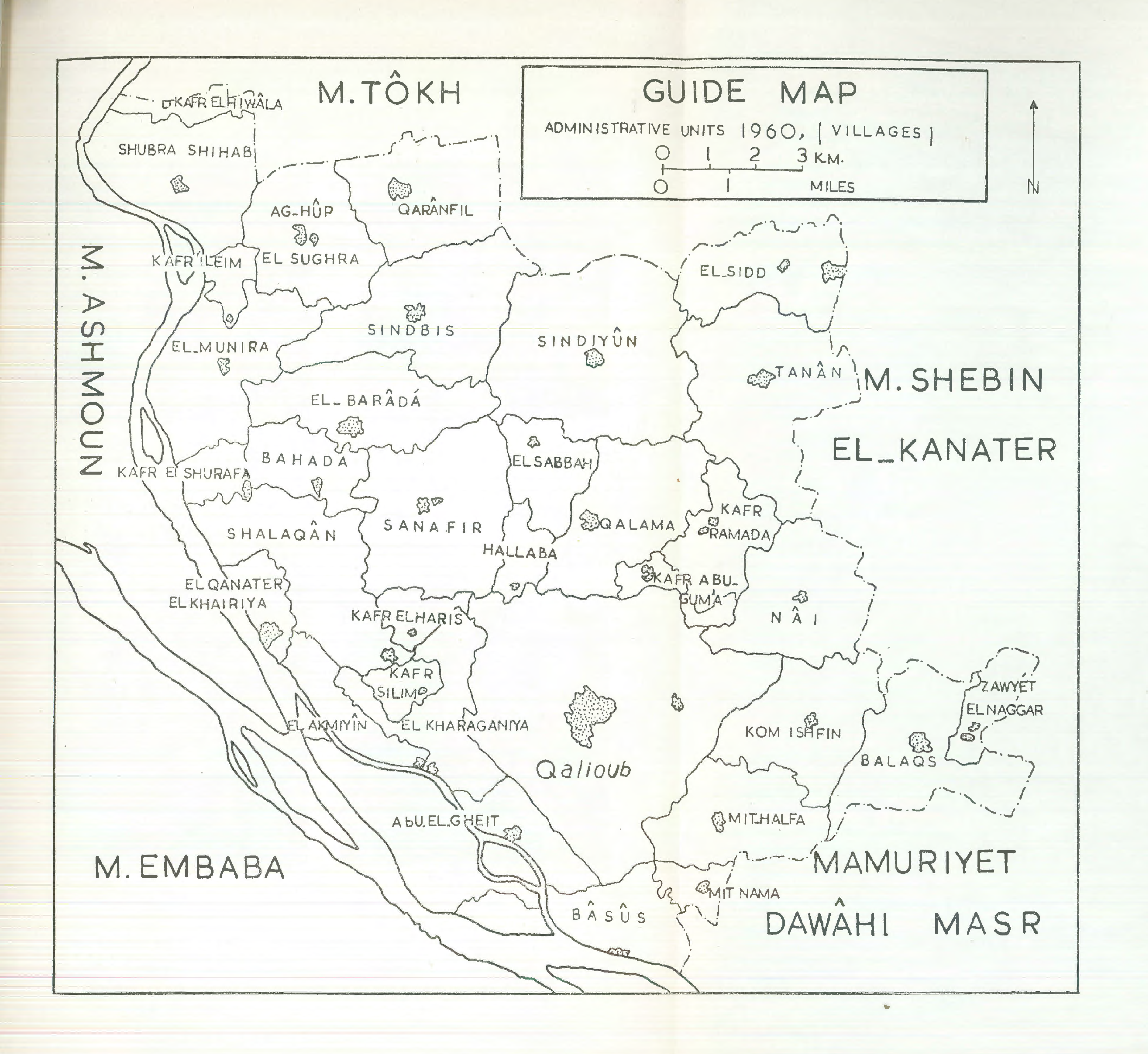


Fig. 8.

Shalaqân and Bahada villages are included in this category. Rents are generally below the L. Eg. 20 level. If compared with the first basis of classification referred to earlier, both classifications reveal striking comparability.

Still another fairly sound classification based on a set of criteria including soil, type of holding and number of parcels per holding, average ownership, rent, percentage of population engaged in agriculture and intense of cropping — as measured by crop area — could be given. Qalioub

can be divided into three distinct sectors : West, South and the rest of the Markaz (Fig. 8). The first sector is mainly occupied by «Gezira» lands with their light soils, a fairly large ownership and relatively high percentage of leased land. Medium rent values prevail, rather medium sized holdings with a fewer number of parcels are common. These lands have been affected by land reform. On the other hand the south is characterized by medium light soils. A relatively high percentage of land is leased, and a considerable proportion of population is engaged in other activities rather than in agriculture. Ownerships are relatively large, hence heavily affected by land reform laws. High rents exist. Not different from the above category, a relatively high proportion of land is put under vegetables and fruit trees. The third category comprising the central parts, eastern and northern, follow the traditional agricultural system practised elsewhere in the Delta. Here most of the land is utilized by owner «Ala El-Zemma». Ownerships are smaller, rents are medium and a high proportion of population is engaged in agriculture with the result of more intensive cultivations and a high level of crop area (over 180% of actual area). These lands were less affected by land reform regulations. Comparing these three different bases of classification one is inclined to think that there is in general terms, a quite-striking comparability among the three.


GUIDE MAP
ADMINISTRATIVE UNITS 1960, (VILLAGES)
0 1 2 3 K.M.
0 1 MILES
N
M. TÔKH
M. ASHMOUN
M. SHEBIN
EL_KANATER
M. EMBABA
MAMURIYET
DAWÂHI MASR
KAFR ELHIWÂLA
SHUBRA SHIHAB
AG_HÛP
EL SUGHRA
QARÂNFIL
KAFR ILEIM
EL_SIDD
SINDBIS
EL_MUNIRA
SINDIYÛN
TANÂN
EL_ BARÂDÁ
BAHADA
KAFR El SHURAFA
ELSABBAH
SHALAQÂN
SANAFIR
QALAMA
KAFR RAMADA
HALLABA
EL QANATER
ELKHAIRIYA
KAFR ABU_ GUM'A
KAFR ELHARIS
NÂI
KAFR SILIM
EL AKMIYÎN
EL KHARAGANIYA
ZAWYET ELNAGGAR
KOM ISHFIN
BALAQS
Qalioub
ABU.EL.GHEIT
MIT_HALFA
MIT NAMA
BÂSÛS



A



B



C



D



A



B

RICE CULTURE IN EGYPT

A STUDY IN HISTORICAL GEOGRAPHY

BY

A. F. WEHEBA

Since the opening decades of this century, Egypt has been witnessing a remarkable development in rice culture. This article attempts to illustrate the geographical background of this development from the historical geographer's viewpoint.

The Plant.

Botanists base their evidence relating to the origin of rice largely on the habitats of wild species, which presumably are derived from two genetical sources, the main one in Asia, the other in Africa. It is most likely that the African source has given species to South America [1]. Among the Asian species « Oryza fatua» and « Oryza sativa» are polyphiletic; important west African species being « Oryza stapfii» and « Oryza glaberrima». The two Asian forms occur in moist lands and are botanically identical except for the shattering at maturity of the « Oryza fatua» [2]. « Oryza sativa» is considered to be resulting from crossing of so many forms with cultivated varieties. In West Africa rice species seem to have been grown on the fringes of the neolithic Sahara and so continued for countless ages the source of African rice [3]. As late as the mid-fourteenth century A.D. West African cultivators were still growing solely African « Oryza gluberrima [4], for Asian species

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[1] Grist, D. *Rice*. London, 1959, p. 3.

[2] *Ibid.* See Chevalier, A. et Angladette, A. *Le Riz*. Paris, 1948, p. 9 et seq.

[3] Grist, D. *Op. cit.*, p. 3.

[4] Ibn Battuta. *Travels in Asia and Africa*. London, 1957, p. 322.

were introduced by the Portuguese in the seventeenth century [1]. At present African species are no longer grown and « Oryza sativa» is the source of all cultivated rice [2].

THE ORIGIN OF RICE.

The origin of rice must always be a matter for conjecture. According to Vavilov the south-west Himalayas is the centre of origin of rice [3]. Copeland, on the other hand, believes that rice originated in South-east Asia [4]. It may well be that other places in India, Indonesia the Philippines and Africa are likewise centres of origin of cultivated rice [5]. Whether rice is of Asiatic or African origin, it is most probable that it was first cultivated in Asia, perhaps in the region between south China and Indonesia, where it is still growing wild. As evidence the earliest historical references with regard to rice growing, are extant in Chinese writings of about five thousand years ago. It is stated that the privilege of sowing paddy was reserved for the reigning emperor ; the less important cereals being reserved for the princes of his family [6].

AN EARLY VOYAGE.

It is not our purpose to follow up the spread of rice from its likely centres of origin. Suffice it to mention its early voyage in the Middle East and the Mediterranean world.

Pursuing the westward spread of rice, there is proof of its cultivation in the Euphrates Valley some four hundred years before the commencement of the Christian epoch. At the same time the Greeks learned of rice

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(1) CHEVALIER, A. et ANGLADETTE, A. *Op. cit.*, p. 12.
(2) FORD, C.D. *Habitat, Economy and Society*. London, 1952, p. 425.
(3) VAVILOV, N. *The Problems of the Origin of Cultivated Plants*, 1930. Pl. Breed. Abs.
(4) COPELAND, E. *Rice*. London, 1924, p. 38 et seq.
(5) SAUER, C. *Agricultural Origins and Dispersals*. New York, 1952, pp. 74-83. G. Schweinfurth argues that wild rice is indigenous to some parts of tropical Africa and was by some way or another passed to Asia at a very remote date (*Bull. Soc. Khéd.*, série IV, 1894, p. 95 et seq.).
(6) GRIST, D. *Op. cit.*, p. 5.

from the Persians after the campaigns of Alexander the Great. The reports of Aristobule who took part in these campaigns circa 344-324 B.C. are said to be the source Diodore of Sicily (1st century B.C.) referred to in his description of the plant and the methods observed in its cultivation [1]. Also, Syria must have been cultivating rice sometime before Strabo's visit in the 1st century B.C. Like the Greeks, the ancient Romans knew rice as a result of their conquests in the East [2]. To the ancient Romans rice was, as states Pliny (1st cen. A.D.), a medicinal plant [3]. It was imported, for its cultivation in the Mediterranean plains and coastal lands did not take place until the rise of Islam [4]. It can be said with certainty that the Arabs introduced an Asian species of rice into Egypt first, from whence its cultivation spread westwards to North Africa, Andalusia and Italy. The Turks introduced it over much of the south-eastern part of Europe, from whence it spread to the Balkans [5].

RICE WAS NOT A CROP OF THE ANCIENT EGYPTIANS.

In the study of cereals cultivated in ancient Egypt we rely in the main on botanical and archeological material. In fact the exploration of Pharaonic tombs has permitted the examination of ancient Egyptian flora in a condition that could not have been anticipated, plant remains originally votive offerings being preserved with scarcely any change [6]. Yet, not a trace of rice is to be found in Egyptian tombs [7]. Further,

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(1) GRIST, D. *Op. cit.*, p. 6.
(2) See (*a*) ROSTOVTZEFF, M. *The Social and Economic History of the Hellenistic World*. Oxford, 1941, p. 12.
(*b*) PRÉAUX, C. *L'Economie royale des Lagides*. Paris 1939, pp. 61-151.
(*c*) HARDY, E. *The Large Estates of Byzantine Egypt*. N.Y., 1931, chap. VI.
(3) PLINY. *The Natural History of Pliny*. Trans. by J. Bostock and H. Riley. London, 1815, vol. III, p. 28.
(4) MOSSERI, M. *Sur l'origine du riz et l'histoire de sa culture en Egypte*. *Bull. Inst. Egypte*, t. IV, 1921-1922, pp. 25-34.
(5) GRIST, D. *Op. cit.*, p. 7.
(6) CARRUTHERS, W. *Plants of Ancient Egypt....* *Nature*, sep. 1886, pp. 451-454.
(7) DE CANDOLLE, Alph. *L'origine des plantes cultivées*. Paris 1883, p. 340.

ancient records, Egyptian as well as Persian, are silent on the matter. Even the Bible makes no mention of rice. Only at a later date did the Talmud make reference to its cultivation [1]. «Rice, states Copeland, was not a crop of the Egyptians or Chaldeans in very ancient times» [2].

However, M. Caylus argues that rice was known to Egypt of the Pharaohs [3]. He takes as evidence what he believes to be rice chaff stuck by means of a certain gum around a small bronze statuette of Osiris. This evidence would have been of great value had we been clear on the date of this object. Whether it is of Pharaonic or Ptolemaic origin, the chaff, we venture to suggest, could be that of wild African rice found useful in preserving bronze articles [4].

We, therefore, accept the forementioned general belief that Egypt did not cultivate rice before the Arab conquest in c. 641 A.D. In our view this is partly borne out by what the passages of Strabo reveal. Strabo, who on his travels to the East visited both Egypt and Syria, remarks on rice cultivation in Syria but makes no mention of it in Egypt [5]. Furthermore the Coptic word for rice «Piarros» is not of Pharaonic origin [6]. In this connection, the resemblance of the two Latin words, «Olyria» (rice-wheat), well known in ancient Egypt and «Oryza» (rice), is probably the cause of some confusion encountered in the works of some classical writers [7].

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(1) Mosseri, M. *Sur l'origine du riz et l'histoire de sa culture en Egypte. Bull. Union Ag.*, t. XX, 1922, p. 5-15.

(2) Copeland, E. *Op. cit.*, p. 5 et seq.

(3) De Caylus, M. *Recueil d'antiquités.* Paris 1752, t. 1, p. 111.

See (*a*) Sonnini, C. *Voyage dans la Haute et Basse Egypte.* Paris 1793, t. I, p. 264 et seq.

(*b*) Hartmann, F. *L'agriculture dans l'ancienne Egypte.* Paris 1923, première partie.

(4) See (*a*) Daressy, G. *Le riz dans l'Egypte antique. Bull. Inst. Egypte,* 1922.

(*b*) Delile, A. *Histoire des plantes cultivées en Egypte. Descr. Eg.*, t. 19, *Hist. Nat.* Paris 1824, pp. 41-67.

(5) Mosseri, M. (1922). *Op. cit.*, p. 12.

(6) Täckholm, Viviand Gunnar. *Flora of Egypt.* Cairo, 1941, vol. I, p. 412.

(7) See Theophrastus. *Enquiry into Plants.* Trans. by A. Hort. N.Y., 1916, p. 199.

Rice Cultivation in the Arab Period (641-1517 A.D.).

The first authentic mention of rice cultivation is to be found in medieval Arabic sources. Yet, the scantiness of information bearing directly on the subject opens the way for speculations. When and how its propagation took place, and to what extent its cultivation spread, are questions that conceivably cannot be adequately answered.

It is difficult in view of the insufficient material available to fix a certain decade (or even century) that witnessed the propagation of rice in Egypt. Nor are we in a position to point to the country of origin it directly came from. The earliest mention of rice in Arabic documents is made by Al-Makdissy and Ibn Hawkal who both lived in the tenth century A.D. [1]. The brief but suggestive remarks on rice cultivation in the Faiyum province strengthen the belief that its propagation most probably took place first in this province and much earlier than the tenth century. In the opinion of Al-Makdissy the Faiyum « is the best-watered province in Egypt». He bases such a conclusion on the fact that « it cultivates rice» [2]. More revealing perhaps, is his following statement « The water of the Faiyum is salty for it runs down rice fields» [3]. That rice in the Faiyum was then in abundance is ascertained by Ibn Hawkal who noted that it « was the premier crop in the surroundings of the capital city El-Faiyum» [4]. Later El-Nabulsi's description of the Faiyum in the 13th century reveals the wide extension of rice culture before it had given way to sugar-cane, probably in the first half of the twelfth century A.D. [5]. Indeed the Faiyum province was, then, an ideal place for paddy cultivation, its abundant water supply available all the year round and well maintained drainage system being major attributes.

Rice cultivation was made to flourish in the Faiyum from the 10th down to the twelfth century; documentary evidence confirms this conclusion.

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(1) (*a*) El-Makdissy. *Kitab Ahsan Al-Takaasim...* Leyden, 1906 — Arabic text.

(*b*) Ibn Hawkal. *Kitab Sorat El-Ard.* Beirut, 1960. — Arabic text.

(2) El-Makdissy. *Op. cit.*, p. 208.

(3) *Ibid.*

(4) Ibn Hawkal. *Op. cit.*, p. 149.

(5) El-Nabulsi. *Kitab Tarikh El-Faiyum.* Cairo, 1898, pp. 6-26 — Arabic text.

To quote Al-Idrisi (12th C.) in his description of the province « the Faiyum is a fertile land which has fruits and cereals in abundance and in particular rice which is cultivated in preference to other grains» [1]. Yet this rich land was not a healthy place to live in for «it has an unhealthy air pernicious to travellers and foreigners» [2]. May not we take this statement as an indication of the prevailing malarial conditions consequent upon the extension of this semi-aquatic crop?

The rapid retreat of rice in the Faiyum, revealed by El-Nabulsi at the opening of the thirteenth century, may be due to the state of decadence that overtook irrigation works in the province, the decrease in the El-Munha (Bahr Youssuf) discharge and no less, to a growing preference of sugar-cane to both rice and cotton. Many a locality gave up the cultivation of rice because of the acute shortage in irrigation water. In fact marginal land fell back into waste. « The village of That El-Saffa, states El-Nabulsi, « gave up rice growing a few years ago to save irrigation water for the recently introduced sugar-cane» [3]. It is significant that out of 138,775 ardebs of cereals and beans produced in the Sultan domain, rice production represented less than $^1/_{10}$ [4]. Since rice, like other summer cash crops, was the monopoly of the Sultan and wealthy landlords, it must be assumed that it occupied a much less restricted area outside the large estates. Much more significant in this connection is, perhaps, the complete silence observed by Ibn Mamati (12th century) [5] concerning rice cultivation. It seems despite the forgoing quotation that rice in the Faiyum, a « Nili» (flood) crop, of short duration in the land and low yield, must have ranked low in relation to the traditional food crops namely wheat, barley, and millet. This is explained below.

Far away in the Western Desert, the oases were also growing rice, probably sometime before the Arab conquest. In fact rice cultivation had already been established in some oases of North Africa a long time

(1) El-Idrisi. *Description de l'Afrique et de l'Espagne...* Trad. par R. Dozy et M. de Goeje, Leyden, 1894, pp. 175-176.

(2) *Ibid.*

(3) El-Idrisi. *Op. cit.*, p. 103.

(4) El-Nabulsi. *Op. cit.*, p. 23.

(5) Ibn Mamati. *Qwanin El-Dwaawin.* Cairo 1943. — Arabic text.

before the Arab rule. The Garamantes are reported by Strabo to have cultivated rice [1]. A. Chevalier and A. Angladette argue that the Garamantes grew an African variety that was still being cultivated on a wide scale in some parts of West Africa in 1895 [2]. We prefer to think that in pre-Islamic days the Egyptian oases, too, knew an African variety similar to that grown by their western neighbours, the Garamantes. The Asian species, it seems supplanted the African one gradually after the establishment of Arab rule in Egypt. However, the oases were never renowned for their rice, supposedly a summer crop [3]. This could be attributed largely to the inferiority of the variety grown and the deficiency of the artesian water in certain fertilizing elements. It is to be noted that medieval documents relating to rice growing in the oases mainly belong to the later part of the Arab period. Of these documents, Ibn Duckmak's description of the oases in the 14th century, is more suggestive. Out of the 24 localities mentioned, more than half of which concentrated in the Dakhla oasis [4]. This simply implies a wide extension of rice in the oases. As explanation, it may be safe to suggest that the development of such culture in the oases at a time when it was on the decline in the Faiyum, found stimulus in the presence of copious artesian water supply, which mostly everywhere flowed from time immemorial, without any need of lifting machines. Further, it seems that the high percentage of salts in the soils of the oases made the cultivation of rice in particular a matter of necessity [5]. For the thorough soaking to which the land was subject when under rice, and the continual running of fresh water on the land washed away harmful salts. We may add that if the crop was sometimes subject to a diminution in acreage, this was in all probability due to either the encroachment of sand dunes upon the cultivable land or to depopulation.

(1) See De Candolle, Alph. *Op. cit.*, p. 340.

(2) Chevalier, A. et Angadett, A. *Op. cit.*, p. 12.

(3) Delile, A. *Op. cit.*, p. 11.

(4) Ibn Duckmak. *Kitab El-Intisaar* .... Cairo, 1872, vol. 5, p. 11 et seq.

(5) Mitwalli, M. *Economic Development of the Egyptian Oases. Bull. Inst. Fouad 1er du Dés.* T. I, Jan. 1951, pp. 122-149.

We are ill-informed on rice growing in Egypt proper in the 14th and 15th centuries. Save a few brief remarks on the place of rice in the traditional agricultural calendar, we possess no information of value [1]. Why, if we may ask, did nearly all the contemporary Arabic sources ignore the mention of this crop, despite the fact that its cultivation was still in practice, and juging by later evidence, never ceased? We are inclined to attribute this silence observed on the part of the Arab geographers, writers, and travellers to the very modest place rice occupied then, among the traditional food crops of Egypt, not to mention its cultivation in restricted and isolated patches. Most likely, rice was still a grain crop for export, far from familiar. This opinion finds supports in the voluminous literary work. «Nihayat el-arab» by El-Nowairy (14th century) [2]. In a poetical description of the plants grown in Egypt, El-Nowairy accounts for all the plants with the exclusion of rice. Apologetically, he rejoins, « I could not find any verse relating to rice to quote» [3].

In the light of existing material we can say with a measure of certainty that rice cultivation in the northern fringes of the Delta slowly gained ground under the Memlouk rule (1250-1517), while was progressively diminishing in range in the Faiyum province. One of the early remarks in this regard, is that made by El-Dahiry in the 15th century. In his description of the province of El-Dakahlia and El-Mortahyia (situated between lake Menzala and the Damietta Branch) El-Dahiry states that, most of its inhabitants grow sugar-cane, colocasia, and rice which depends on flush water derived from «Bahr El-Manzala» [4]. No mention of rice in the Faiyum is made Later. Leo Africanus (16th early century) spoke of rice fields and date groves surrounding Rosetta [5]. About

(1) See (*a*) Makrizi. *Al-Khetat*. Cairo, 1904, vol. II, p. 33 — Arabic text.
(*b*) Ibn Mamati. *Op. cit.*, p. 238.
(*c*) Ibn Hawkal. *Op. cit.*, p. 129.
(2) El-Nowairy. *Nihayat el-arab* .... vol. 11, Cairo 1935.
(3) *Ibid.*, p. 23.
(4) El-Dahiry. *Kitab Zubdat Kashf El-Mamalik*. Paris 1892, p. 34 — Arabic text.
(5) Leo Africanus. *The History and Description of Africa*. Done into English in the year 1600 — Edited by R. Brown. London, 1896, vol. III, p. 866.

the Faiyum he, too, made no reference to rice growing. Presumably rice production in the Faiyum must have declined completely well before the opening of the 15th century. At the same time a new centre of production sprang up in the northern fringes of the Delta, particularly in the vicinities of the two riverports Rosetta and Damietta. Here, natural conditions for rice cultivation were ideal, perhaps more so than in the Faiyum province. This is because irrigation water direct from the Nile branches was available all the year round, and the difference in water level between high and low Nile did not exceed 1 $^1/_2$ metre, a feature which undoubtedly permitted, when the Nile reached its ebb, of relatively easy and unexpensive lifting of water by means of water-wheels and Archimedian screws. We may add that accessibility to foreign markets must have stimulated rice producing in these areas.

Rice Cultivation under the Turkish Rule.

In 1517 the Turks conquered Egypt, and for about three centuries hence Egypt lived a hard time. Population decreased because of insecurity and ravaging epidemics, and agriculture declined as a result of the silting up of canals and destruction of embankments [1].

Paradoxically enough, rice cultivation showed signs of prosperity that could only be attributed to an increasing demand for rice local and foreign. And because rice was remunerative and saleable, landlords spared no effort in meeting the needs of the consumers. As a result, foreign trade in rice became active. Indeed credit must go to the Turks for introducing rice over much of the south-eastern part of Europe and for encouraging its cultivation in the north of the Delta. Shipments of Egyptian rice are reported to have made their way annually to the markets of « Istanboul». F. Vansleb remarks on such trade by saying « I was told that every year about five hundred ships go out of this haven (Damietta) small and great loaded with rice for Turkey» [2]. Boiled rice or « Pilav» made a favourite dish at least for the rich Turks. Also

(1) Hanotaux, G. *Histoire de la Nation Egyptienne*. Paris, 1931, T. I, pp. 72-75.
(2) Vansleb, F. *The Present State of Egypt*. London 1678, p. 67.

well-to-do Egyptians became fond of rice-eating and in their feasts a huge plate « containing a mountain of boiled rice», was usually present [1]. Outside the Nile Valley, the oases-dwellers continued producing modest amounts of a low-grade rice for local consumption [2].

To secure a continuous supply of the best Egyptian rice and perhaps to keep the infidels in the dark about the secrets of rice cultivation, the Turks seemed to have enforced certain measures. Of these edicts « no Christian is permitted to inspect narrowly into the plantations of rice» [3]. Further a ban was imposed on the exportation of the excellent Sultani rice produced in the Rosetta region, to any Christian country. The infidels, it is assumed, should not be privileged by eating such rice [4]. It was only the moslems, especially the Turkish, who had the privilege to do so [5]. If, however, the Christians wished to procure Egyptian rice they should seek it in the Damietta store-houses. The following passage written by M. Savary towards the end of the 18th century is in conformity with our conclusions.

« Le riz des environs de Rosette est connu sous le nom de Sultani. C'est une erreur de croire qu'il en vienne à Marseille. Destiné à l'approvisionnement de Constantinople des défenses rigoureuses en empêchent l'exportation chez l'étranger. C'est à Damiette que les provençaux en vont chercher des chargements» [6].

Beside Al-Hassan El-Wazan El-Fasy (better known to Europeans as Leo Africanus) Egypt received for nearly three centuries since the Turkish conquest in 1517, an array of travellers and pilgrims, some of whom cared to give us some hints on the geography of rice. The names of G. Sandys, F. Vansleb, F. Norden, T. Shaw, G. Sonnini, E. Brown and

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(1) SAVARY, M. *Lettres sur l'Egypte*. Paris 1786, vol. II, pp. 43-56.

(2) See (*a*) DELILE, A. *Op. cit.*, p. 51.

(*b*) WILKINSON, Sir Gardner. *Modern Egypt and Thebes*. London, 1843, vol. II, pp. 358-373.

(3) SHAW, T. *Travels*. London, 1757, pp. 406-407.

(4) REYNIER, L. *Commerce-Mémoires sur l'Egypte*, 4e partie. Paris, 1815, pp. 61-66.

(5) Rice was still dear for the fellah and therefore did not enter into his diet.

(6) SAVARY, M. *Op. cit.*, vol. I, p. 57.

M. Savary are well known in this respect [1]. It goes without saying that these remarks cannot in any way be compared with the valuable study made by M. Girard on rice cultivation in Egypt a year or two before the close of the 18th century [2]. We shall make ample reference to this study in another place.

VARIETIES AND ARCHAIC METHODS OF CULTIVATION.

As far as paddy cultivation is concerned, the close of the eighteenth century marks the end of a long period of very gradual development. Apart from the studies of the French savants of the late 18th century and the casual remarks made by contemporary travellers, we possess practically nothing as to the traditional methods of cultivation adopted and the varieties grown under the Arab and Turkish administrations. But one cannot fail to deduce from the brief remarks made by some Arab geographers and writers that the variety grown in the Faiyum differed from that (or those) sown in the northern low-lying land of the Nile Delta in terms of duration in the field and water requirements. It must have given rise to a short duration « Nili» (flood) crop which was, as its name denotes; replenished by flood water. According to Ibn Hawkal (10th century) [3] and the traditional agricultural calendar, extant in some Arabic sources [4], it was sown in the month of «Abib» (July) and harvested in «Hatour» (November). Thus it stayed some

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(1) See (*a*) SANDYS, G. *Sandys Travels Begun in 1610*. London, 1676.

(*b*) VANSLEB, F. *The Present State of Egypt*. London, 1678.

(*c*) NORDEN, F. *Voyage d'Egypte et de Nubie*. Vol. I, Paris 1795.

(*d*) SHAW, T. *Travels*. London, 1755.

(*e*) SONNINI, G. *Voyage dans la Haute et Basse Egypte*. Paris 1793.

(*f*) BROWN, E. *The Travels and Adventures of E. Brown*. London, 1739.

(*g*) SAVARY, M. *Lettres sur l'Egypte*. Paris 1786.

(2) GIRARD, M. *Mémoires sur l'agriculture, l'industrie et le commerce de l'Egypte. Description de l'Egypte, état moderne*. Vol. II, pp. 521-525.

See also AUDEBEAN, Ch. *L'agriculture égyptienne à la fin du XVIIIe siècle. Egypte contemporaine*, Fév. 1919, pp. 132-169.

(3) IBN HAWKAL. *Op. cit.*, p. 129.

(4) See IBN MAMATI, p. 238.

five months in the field and benefited mostly of the flood water. Since the effective use of the flood water depended as much on its level as on the effort of man, it is obvious why rice cultivation diminished in the Faiyum consequent upon the state of negligence that befell its canals and embankments. The rice variety that met with success in the northern part of the Delta produced a « seifi» (summer) crop that according to some authorities was sown in « Beshince» (May) and harvested in Babih (October). M. Girard, however, fixes the first week of April as the usual time for broadcasting. This may mean that more than one variety were grown prior to the 19th century. Furthermore, the fact that Ibn Mamati's agricultural treatise (12th century) ignores mentioning the dates of the « Nili» crop reported to have been then in cultivation in the Faiyum province, presupposes the cultivation of the « Seifi» crop somewhere in the northern Delta. Did the beginnings of the « Seifi» rice cultivation go back to a date earlier than that suggested above? The answer must remain inconclusive.

In terms of the methods adopted in planting harvesting winnowing and hulling we possess no early records. But if we consider the remarkable conservation of the Egyptian peasant, we may look upon the study of these matters mades by M. Girard (alluded to above) as applicable to earlier histories. In the eighteenth century and apparently in previous centuries the « Seifi» rice land in the Delta was bounded on the north by the shores of the deltaic lakes and did not extend southwards beyond a line running between Rahmania in the west and Mansoura in the east (Fig. 1) [1]. However, the greater part of this crop was produced in the neighbourhoods of Rosetta and Damietta. As to its cultivation it was one that called for skill and experience. Of great importance was to have the land quite level. After covering it with water for some days it was worked in two directions at right angles. A third ploughing was usually requisite. Afterwards rice cultivators submerged the ground, rolled it divided it into basins by small dikes

[1] AUDEBEAU, Ch. *Terres du Bas Delta restées fertile à la suite de l'abandon de la culture dans le nord de l'Egypte... Bull. Inst. Eg.,* vol. VIII, 1925-1926, pp. 205-220.

and finally broadcast the seed into the mire which was formed by these operations.

Seed, however, was subject to certain preparations before sowing. About 15 days before it was intended to sow the preparation of the seed started. First it was put in baskets which were immersed in a canal for

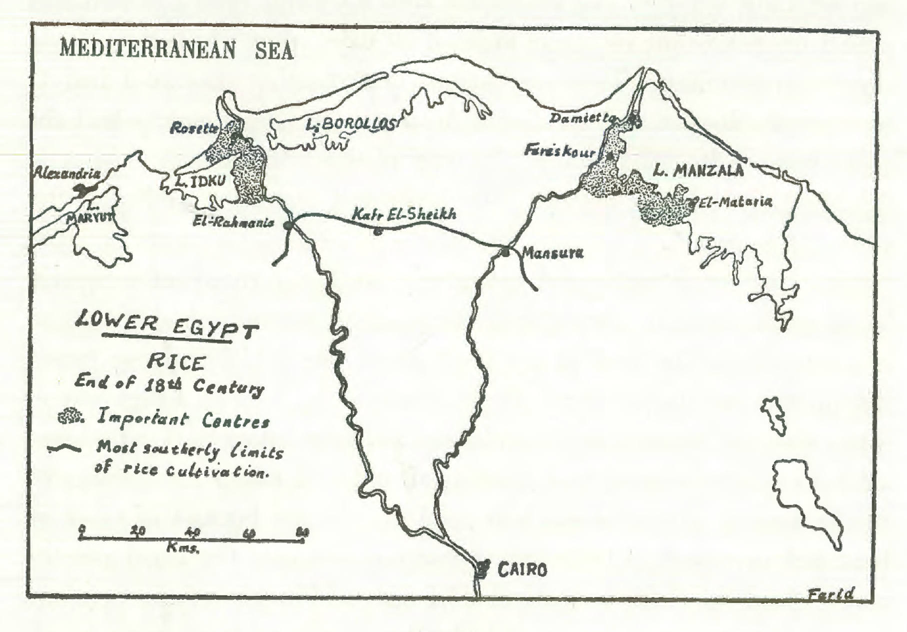


Fig. 1.

six or seven days. Meanwhile, it was continually stirred up to stimulate germination and rid it of dirt. The baskets were subsequently pulled out of the canal to have their content spread over and covered with a layer of green grass. In about 24 hours the seed would be seen germinating. The germinated seed was then sown in a flooded land at the rate of about 100 Kilos per feddah, a quantity which is double the amount needed at present for a seedbed of equal dimensions provided the broadcasting method is applied. It was through this practice that sufficient quantities of seedlings were made available for planting fields which were still being occupied by winter crops at the time of sowing. We are informed that seedlings were not only available for neighbouring fields but also for distant ones. The Menzala area for instance was

supplied with seedlings pulled from the Faraskour rice fields, some 45 Kilometres away [1]. Seedlings were in the first stage of the journey carried by boats across the Menzala lagoon then by camels to their destination. A boat-load, of seedlings (probably over two tons) is reported to be sufficient to plant a feddan of slightly wider dimensions than the one we know today [2]. To obtain the best of results seedlings were not pulled up before the elapse of about 100 days, after which they would stand transplanting. However, before transplanting, the land had to be worked, flooded and levelled. According to Girard nearly half the area occupied by paddy was at the end of the 18th century subject to this method of transplanting. Obviously wet nurseries as kept today were not known [3].

Rice production depended essentially on the amount of irrigation water made available throughout the growing season. And since rice is a waterlover, the level of the flood water was a determining factor, not to mention its beneficial effects. Indeed no crop in Egypt was as extravagant in water requirements as rice. According to G. Dudgeon a feddan of rice is equal to 3 feddans of cotton in water consumption [4]. In the oases a feddan of rice will need more water because of excessive heat and dryness [5]. To supply water requirements the usual practice was to flood the fields to a depth of 5 c.m. within 48 hours of sowing. In two or three days water had to be drawn off and fresh water let in. This operation was repeated till harvest time. Water-wheels moved by oxen were the principal machines and made irrigation water available for rice for a period of four months, in the remaining three months rice fields received the turbid flood water without recourse to machines [6].

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(1) Girard, M. *Op. cit.*, p. 523.

(2) A feddan was equivalent to 5929 sq. ms. At present it only measures some 4200 sq.ms.

(3) Abd El-Raouf, A. *Egyptian Rice* — Ministry of Agriculture Cairo, 1958, pp. 1-11 — Arabic text.

(4) Willcocks, W. and Craig, J. *Egyptian Irrigation.* London, 1913, vol. I, p. 401.

(5) Beadnell, H. *An Egyptian Oasis.* London, 1909, p. 213.

(6) Audebeau, Ch. *La région de Rosette et l'irrigation pérenne avant le XIXe.* *Bull. Inst. Eg.*, vol. X, 1927-1928, pp. 97-103.

No manures of any sort are reported to be in use but weeding was requisite [1]. Weeds mostly of Indian origin were and still infesting rice fields [2].

After-Cultivation.

The two months of October and November witnessed rice reaching maturity. Harvesting, a tedious task, commonly fell to the lot of migratory, miserable labourers drawn from distant localities and paid in kind. Using sickles for reaping, they bound the crop in small sheaves to be removed, when sufficiently dry, on the backs of donkeys and camels to threshing grounds. There, the stalks were chopped by peculiar cart with iron disks called «Noreg», and the grain got separated from the stalks. Threshing was usually carried out in the early morning and late evening when moist. Winnowing followed threshing and was performed by means of a wooden fork which was used to toss the chopped straw, grain and various impurities into the air to separate the grain from the straw. The heaps of grain, earth and foreign seed were then passed through riddles to separate the grain. This done, the grain was left in the open air to day before sale to commercial mills. Concentrating at both Rosetta and Damietta. On arrival at these mills (which were driven by oxen) paddy was subject to further seiving to remove extraneous matter. The grain was then hulled cleaned, and the product (white rice) got mixed with salt for preservation. On the other hand households used to clean modest amounts for domestic use by repeatedly pounding the grain in large wooden mortars with wooden pestles shod with iron. The yield varied considerably from year to year. Namely, in years of sufficiently high flood a feddan yielded up to 8 ardebs, while in others of low flood the yield dropped to less than 2 ardebs. Before the 18th century we unfortunately possess no figures that will help in evaluating rice production in an average year. Nor could we estimate reasonably

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(1) It was being wrongly assumed that manures were not beneficial until the early years of this century. — See Foaden, G. and Feletcher, F. *Egyptian Agriculture.* Cairo, 1910, vol. II, p. 483.

(2) Täckholm, Vivi and Gunner. *Op. cit.*, p. 411.

the area confined to rice in any period. It is M. Girard who claims credit for the few estimates and figures he recorded in his agricultural studies written before the close of the 18th century. In the light of these figures and estimates and other indications, we may not be mistaken if we suggest that in an average year Egypt of the 18th century produced some 20,000 tons of rice, the yield of some 18,000 feddans, nearly half of which concentrated around Damietta the rest in the vicinity of Rosetta.

« Riziculture» in the 19th Century.

The opening of the 19th century heralded in Egypt a new stage in rice production and consumption. For although the methods of cultivation and milling remained basically the same, rice acreage nearly doubled in the first quarter of this century. Being quite a profitable crop it was the first to be claimed a government monopoly subject to strict orders regarding production and marketing alike [1]. Every effort was made to extend its cultivation in the northern fringes of the Delta, especially in the old rice growing regions of Damietta and Rosetta [2]. Securing enough water for this wet crop (which demands 7,000 m^3 per feddan) was a problem to be tackled with ingenuity. As a first step, deep summer canals capabable of discharging the low-level summer supply were excavated with the help of forced labour [3]. When these canals proved expensive to maintain and impracticable, the building of barrages became an alternative. An so barrages were constructed at the bifurcation of

[1] See (*a*) El-Hitta, A. *History of Egyptian Agriculture — The reign of M. Ali.* Cairo, 1950, p. 242. — Arabic text.
(*b*) Mengin, F. *Histoire de l'Egypte sous le gouvernement de M. Ali.* Paris 1823, T. II, p. 358.
[2] Clot, A.B. *Aperçu general sur l'Egypte.* Paris 1840, T. II, p. 282.
[3] Chrochly, A. *Economic Development of Modern Egypt.* London, 1938, pp. 54-57.
For a detailed study see :
(*a*) Willcocks, W. and Craig, J. *Op. cit.*, vol. I, pp. 366-368.
(*b*) Barois, J. *L'irrigation en Egypte.* Paris, 1887.
(*c*) Bellefonds (Linant de). *Mémoire sur les principaux travaux d'utilité publique...*, Paris, 1812-1813.

the Delta with the view to raising the level of the impounded water in order that it could be carried by arterial and branch canals to the furthest ends of the sown [1]. Raising the level of the irrigation water at the heads of feeders was but a partial solution to the inadequacy of water supply when most needed. Yet, it helped enormously in extending rice cultivation and increasing production. We are informed for instance that in 1823 ricelands produced 122,000 ardebs [2] (some 35,000 tons) and in six years hence, total production rose to 200,000 ardebs [3]. In the absence of sufficient data it is not easy to speculate about the area devoted to rice in most of the 19th century. What is certain is that in this century, as in previous ones, rice acreage oscillated sensibly from year to year as a result of a changing flood level. Even the Aswan Dam (1902) could not free Egyptian summer cultivation of this determinant control. But it may be safe to suggest that in the first three decades of this century rice acreage ranged between 20,000-30,000 feddans rising to nearly 150,000 in the eighties.

A New Development in the 20th Century.

The full conversion of the Delta to perennial irrigation was not, however, achieved until the Delta barrages were put in order in 1890. But no irrigation work was more stimulating to «riziculture» than the Aswan Dam erected in 1902. Indeed, its construction marks the setting in of a new era of plenty and great promise. This is because the storage of the flood waters meant in the first place, a guaranty against low summer supplies, in other words a protection against the failure, if not the diminution in area of lucrative summer crops, i.e., cotton, maize, sugar-cane, and rice. For a more efficient distribution of the stored waters,

[1] See (*a*) Brown, R. *History of the Barrage.* Cairo 1896.
(*b*) Willcocks, W. and Craig, F. *Op. cit.*, vol. II, pp. 632-655.
(*c*) The construction of these barrages actually began in 1843 but was not completed until 1864.
[2] Mengin, F. *Op. cit.*, T. II, p. 358.
[3] Chrouchley, A. *Op. cit.*, p. 65.
Douin, G. *L'Egypte de 1828 à 1830.* Rome, 1935, p. 381.

a number of small barrages were built, and carrier canals cut [1]. With increasing water demands the Aswan Dam had to be twice heightened; 1912 (2.5 milliards m³) and 1933 (5.7 milliards m³) at the same time draining excess surface and subsoil waters, especially in the low lying rice land, became imperative. The erection of the Gebel El-Awlia Dam (2.5 milliards m³) in the Sudan was complementary to the ambitious water conservation scheme in Egypt, culminating today in the construction of the High Dam, which actually replaces a set of proposed projects [2].

Conceivably, the availability of copious water supplies, and the high prices fetched in the foreign markets, were behind the extension of rice cultivation both horizontally and vertically, despite the stiff competition of cotton, Egypt's premier cash crop [3]. Two other factors cannot be ignored. First, the ever increasing demand for rice at home consequent upon the rapid growth of population, especially in urban centres, and no less, a growing preference shown for it [4]. Second, the frequent use of rice as an ameliorating crop in the final stages of the land reclamation schemes launched in the « Berari» (waste land) of the Nile Delta [5].

Undoubtedly rice has contributed so much in restoring the fertility of the saline marginal land of the Delta since the closing decades of the last century. Extravagant in its water requirements (more than 40 m³/day/feddan), it allows of copious washings which dissolve the surface salts from the soil. However, rice cannot be grown unless salinity has been reduced to 0.5 per cent, a hardier wet crop « deneiba» being usually grown in more saline soils [6]. When the land becomes sweet

[1] See (*a*) Hurst, H. *The Nile.* London, 1952, pp. 54-69.
(*b*) Willcocks, W. and Craig, F. *Op. cit.*, pp. 332-399.

[2] Hurst, H. (1952). *Op. cit.*, pp. 281-320.

[3] See (*a*) Anhoury, J. *Les grandes lignes de l'économie agricole de l'Egypte. Egypte contemporaine*, vol. XXXVII, n° 199, 1944.
(*b*) Selim, H.K. *Twenty years of Agricultural Development in Egypt*, 1919-1939. Cairo 1940, p. 15 et seq.

[4] In some parts of the rice land fringing the deltaic lakes, the inhabitants, who are partly engaged in fishing, have become quite accustomed to rice.

[5] Willcocks, W. and Craig, J. *Op. cit.*, vol. I, pp. 449-518.

[6] Hamdan, G. *Evolution of Irrigation Agriculture in Egypt. History of land use in arid regions.* UNESCO Publications, 1961, p. 133.

enough for rice, clover, a netrogenous plant, can then follow. Provided that the subsoil water is maintained at a depth of 70-80 cm. from ground level, cotton can also be grown alternating with rice according to a suitable crop rotation [1].

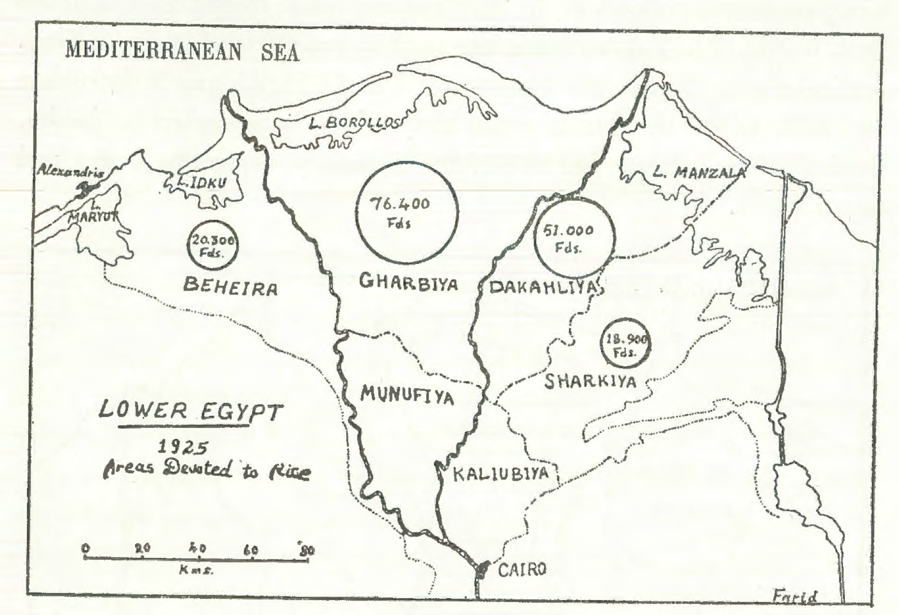


Fig. 2.

And so with no more than 30,000 feddans in the opening decades of the 19th century Egypt cultivated in 1887 exactly 149, 717 feddans (2,4% of the total) with the Faiyum accounting for more than 2,2% of this acreage. Twenty one years later (1908) [2] the area, thanks to summer supply schemes, expanded to reach the 258,000 mark [3]. Generally speaking this trend continued as apparent from figures 2, 3 and 4 down

[1] Hamdan, G. *Evolution of Irrigation Agriculture in Egypt. History of land use in arid regions.* UNESCO Publications, 1961, p. 133.

[2] Gali, K. *Essai sur L'agriculture de l'Egypte.* Paris 1889, p. 288.

[3] Anhoury, J. *Le riz en Egypte. Bull. Union. Agr. Egy.* n° 155, 1924, p. 94.
It must be pointed out that its expansion was dependent on the state of the flood, its acreage being yearly decided by the government in accordance with this factor.

to 1950 [1] (702,983) a date, which from our historical viewpoint, may divide between the past and the present. A phenomenon that deserves mention in this respect has been the gradual southward expansion of rice culture since the end of the 2nd World War, land devoted to rice being no longer confined to the northern less fertile marginal lands of the Delta [2] (fig. 3). Furthermore, the marked extension of its cultivation, particularly in the two governorates of Kafr El-Sheikh and El-Dakahliya was achieved at the expense not only of the primary crops (maize, bersim, cotton, wheat), but also of the secondary, especially, beans and vegetables [3].

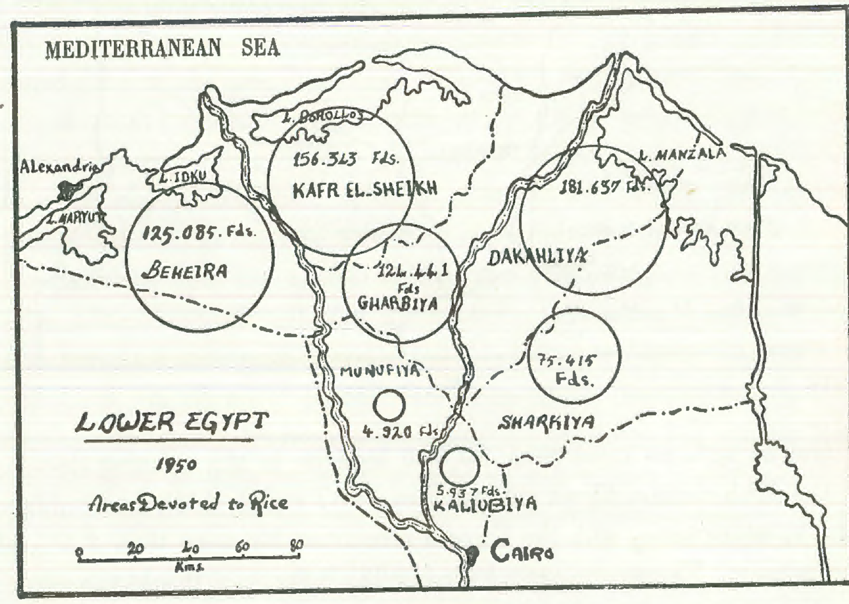


Fig. 3.

Not only did rice production increased in its totality but also per feddan, rising from a mere 1.42 daribas (some 1337 Kgs.) per feddan

(1) Owing to war-time restrictions on cotton cultivation, rice gained in area, but it fell back to pre-war acreage following the cessation of hostilities. Later it continued to gain at the expense of other crops.

(2) Besançon, J. *L'homme et le Nil.* Paris 1951, p. 242.

(3) Hamdan, G. *Op. cit.*, pp. 130, 131.

in the opening years of this century to an average of 1.67 in the period 1945-1949 [1]. This can only be attributed to the efforts spent in developing better breeds, the improvements in the methods of cultivation [2], the increased use of manures and fertilizers and finally the effective control of parasitic weeds, pests and diseases [3]. In terms of foreign trade cargo rice was for long produced for export. In the first half of this century exports grew in volume and rose in value to account for 8% of the total export trade in 1948, this being despite rapidly increasing consumption. For instance over the period 1945-1949 Egypt's rice exports amounted to 276086 tons per annum valued at more than L.E. 15,000,000 [4] whereas in the twenties (1920-1924) such trade could not secure on the average more than 15,000 tons annually priced at L.E. 351,270 [5]. In addition, rice by-products in the form of broken grain, bran, straw, have for many years been of wide use. Customarily, brokens have been made into rice flour (sometimes mixed with wheat flour to make bread), bran given to animals and straw used as fuel and in stables or, when chopped, in brick-making [6]. A characteristic feature of the villages in the rice producing districts of the northern Delta has of late been the presence on the roofs of houses of heaps of rice straw, bundles of dried maize and cotton stalks featuring only occasionally [7].

(1) Société d'Entreprises Commerciales en Egypte. *Le riz dans l'économie égyptienne.* Alexandria, 1949, pp. 9-13.

Yield per feddan has recently passed the 2.4 mark.

(2) Of these improvements, the widespread application of transplanting was the most important.

(3) *Ibid.*, pp. 13-24.

(4) Abd El-Raouf, A. *Op. cit.*, p. 23.

(5) *Ibid.*, p. 21.

(6) The value of the straw for paper-making has been investigated since 1920. It was found to yield a pulp of good quality which is suitable for the manufacture of white and brown paper or for strawboard. At present Egyptian paper industry partly depends on such straw.

(7) On rural settlement see Lozach, H. *Le Delta du Nil.* Cairo, 1935, pp. 40-200.

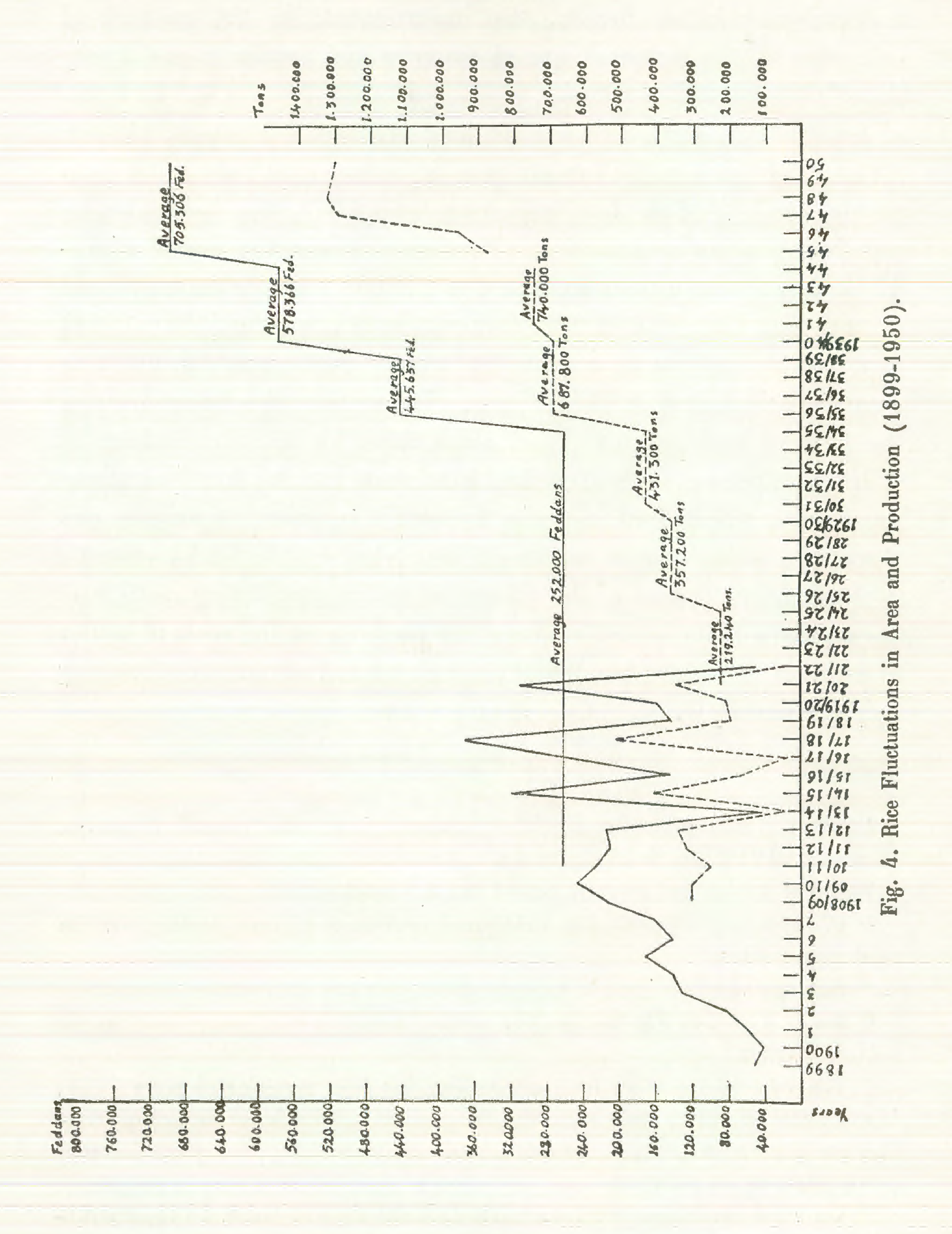


Fig. 4. Rice Fluctuations in Area and Production (1899-1950).

Rice and Malaria.

In the end it may be proper to ask, did the expansion of rice cultivation intensify endemic malaria? In reply we depends on Kirkpatrick's investigation relating to the mosquitoes of Egypt [1]. Recourse is also made to historial evidence as well. It is not easy in the view of Kirkpatrick to reach a clear cut decision as to the effect of rice growing on the distribution of suitable breeding places for mosquitoes carrying malaria. The difficulty arises from the fact that possible breeding places, i.e., pools ponds drains, sakias, shallow wells etc., may occur in the neighbourhood [2]. Furthermore, Anopheles multicolour, said to be the chief carrier of malaria in Egypt, does not breed in rice fields of the Delta [3]. Nevertheless historical evidence and recent records of the incidence of malaria in Egypt reveal that malaria is concomitant of rice cultivation. To quote C. Figari (1885) « The miasmatic foul air hanging over rice fields is the cause of infectious fever» [4]. Earlier C. Sonnini, a traveller who visited Rosetta in 1793 spoke of the mosquito-ridden rice fields and of the discomfort caused by their bites [5]. More revealing perhaps are the recently published records of the incidence of infectious diseases in Egypt. From a cursory look at these records the facts is driven home that the dominantly rice cultivated lands of the northern Delta are malaria ridden. As proof, in 1959 out of the 12,923 diseased persons in the governorate of Kafr El-Sheikh, which is leading in rice producing, 12,750 (98,5%) were suffering from malaria [6].

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(1) Kirkpatrick, T. *The Mosquitoes of Egypt. Anti-Malaria Commission.* Cairo 1925.

(2) *Ibid.*, p. 198.

(3) *Ibid.*, p. 199.

However, Kirkpatrick points out that certain species of mosquitoes breed in rice fields in the oases and carry malaria. Rice in the oases, rejoins Kirkpatrick is largely responsible for the great increase in mosquitoes during the summer and autumn.

(4) Figari, C. « *Studii Scientifici sull'Egitto e sue Adiacenze* », Lucca 1865. Translated into Arabic by A. Nada, Cairo, 1866, p. 29.

(5) Sonnini, G. *Op. cit.*, p. 264.

(6) Statistical Directory — The Governorate of Kafr El-Sheikh. Jan. 1963, p. 93. — Arabic text.

The Future.

As to the future of rice cultivation, there can be no doubt that it will extend speedily after the completion of the High Aswan Dam, presumably occupying some $1^1/_2$ million feddans in the not too distant future [1]. The result must expectedly be a noticeable change in the Egyptian agricultural land use. It is difficult to speculate upon the future place of rice among. Egyptian cash crops. But it is much doubted that it will attain a better place in the near future. Rice, it seems will remain for some time to come second to cotton as a cash crop. However, provided that an efficient drainage system is maintained, manures applied when needed, better methods followed, better seeds developed and finally malaria put under effective control, rice is apt to be for long a valuable source of hard currency and nourishment.

[1] It has been officially announced that the rice crop of 1966-1967 occupies more than a million feddans.

A BIBLIOGRAPHY OF SUEZ CANAL

(1869 - 1969)

BY

ABDEL-RAHMAN ZAKI

Suez Canal is the most vital waterway in the world. It extends from Port Said in the north to Port Tawfic near Suez in the south, and connects the Mediterranean with the Gulf of Suez and thus with the Red Sea. The canal is 173 kilometres long; 65 ms. wide; 14 ms. deep. There are no locks. As early as the 20th or the 19th cent. B.C., during the reign of King Sesostris, a canal was built to Lake Timsah, then the north of the Red Sea. When the Red Sea receded, the canal was extended by Darius King of the Persians. About the year 200 Emperor Trajan opened again the canal, later it fell into disrepair. After the Arab conquest circa 639 A.D. General ʿAmr ibn el-As reopened it again after the approval of Calif Omar ibn el-Khattab, but in 770 it was again closed.

The modern canal was built during 1859-69 by the French engineer Ferdinand de Lesseps, and was owned by a Universal company until 1956, when President Gamal Abdel Nasser nationalized it (26th July 1956). Final compensation to the Suez Canal Company was arranged in 1958 through the World Bank.

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مراجع فى تاريخ وانشاء قناة السويس

(١٨٦٩ – ١٩٦٩)

دكتور عبد الرحمن زكى

قناة السويس أهم شريان ملاحى فى العالم ، تمتد من بورسعيد شمالا حتى بورتوفيق بالقرب من السويس جنوباً ، وتربط البحر المتوسط بالبحر الأحمر بوساطة خليج السويس . يبلغ طولها ١٧٣ كيلو متراً ومتوسط عرضها ٦٥ متراً ، وعمقها ١٤ متراً . تسير مع الحافة الشرقية لبحيرة المنزلة فى خط مستقيم حتى بحيرة التمساح ثم تنحرف إلى البحيرات المرة ، فخليج السويس . والمعروف أن فكرة ربط البحر المتوسط بالبحر الأحمر بوساطة قناة فكرة قديمة . فى القرن التاسع عشر ق . م . حفرت قناة تربط النيل ببحيرة التمساح ، وكانت إذ ذاك الطرف الشمالى للبحر الأحمر وتعرف بقناة سيزوستريس . وحينما تراجع البحر الأحمر ، حاول الملك نخاو (٦٠٩ – ٥٩٣ ق . م .) أن يطهر القناة ويمدها لتتصل بالبحر المتراجع ، ولكن غزو الفرس لمصر لم يمهله ، فأتم العمل دارا الفارسى من بعده ، وتراجع خليج السويس قليلا ، فاضطر بطليموس الثانى إلى مد القناة من جديد . وأعاد الإمبراطور الرومانى تراجان تطهيرها حوالى عام ٢٠٠ .

ولما فتح العرب مصر (٦٣٩ – ٦٤٠ م) كانت القناة قد ردمت ، فأعاد القائد عمرو بن العاص حفرها بعد استئذانه الخليفة عمر بن الخطاب وسماها « خليج أمير المؤمنين » ، وظلت تؤدى الغرض منها حتى ردمت عام ٧٧٠ م بأمر الخليفة العباسى أبى جعفر المنصور . أما القناة الحديثة التى تصل البحرين بطريق ملاحى مباشر فحفرها المهندس الفرنسى فردناند دلسبس بأمر الوالى سعيد (١٨٥٩ – ١٨٦٩) ، وافتتحت فى نوفمبر سنة ١٨٦٩ فى أثناء حكم الخديوى اسماعيل . وفى خلال سنوات قلائل أخذت بريطانيا تعمل للسيطرة

عليها بشراء حصة مصر فى أسهمها من اسماعيل ، وكان ذلك عام ١٨٧٥ ، وكان لمصر نصيب ضئيل من أرباح الشركة . وفى ٢٦ يولية سنة ١٩٥٦ أعلن الرئيس جمال عبد الناصر تأميمها ، فآلت إلى مصر ، وفى عام ١٩٥٨ اتفقت مصر على أن تدفع التعويضات إلى شركة القناة بوساطة البنك الدولى .

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١ — الوثائق [1]

دفاتر صادر المعية .

دفاتر وارد المعية .

دفاتر صادر عابدين .

دفتر وارد محافظة دمياط .

دفتر صادر محافظة السويس .

محافظ المغية .

برقيات واردة لقصر عابدين من الدفتر رقم ١ — ١٠ .

برقيات صادرة من قصر عابدين من الدفتر رقم ١ — ٨ .

مكاتبات القنصلية العامة للولايات المتحدة الأمريكية فى مصر إلى وزارة الخارجية الأمريكية بواشنجتن .

مكاتبات القنصلية العامة لفرنسا فى مصر ومن السفير الفرنسى فى الآستانة إلى وزارة الخارجية الفرنسية فى باريس .

تقارير فرنسية أرسلها رئيس النظار نوبار باشا من باريس فى السنوات ١٨٦٣ ، ١٨٦٤ ، ١٨٦٦ إلى أرام بك لرفعها إلى إسماعيل خديوى مصر .

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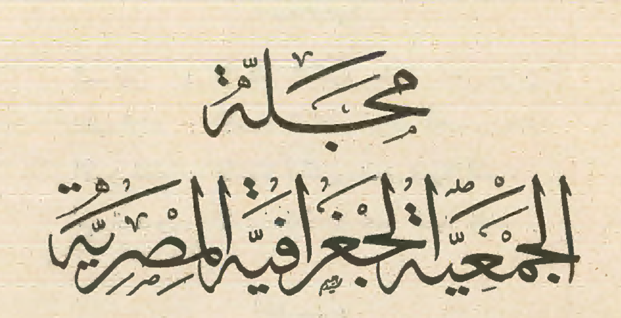
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مجلة الجمعية الجغرافية المصرية

المجلد الأربعون

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